# THÈSE DE DOCTEUR INGÉNIEUR

Présentée

À L'UNIVERSITÉ DE PARIS VI

Par

Mr GENÊTE Maurice

pour obtenir

*le grade de Docteur Ingénieur*

Sujet de la thèse :

Contribution à l'étude, à la réalisation et à l'exploitation d'un prototype expérimental de combinateur électronique optimisant adapté à l'ordonnancement et à la fluidification du trafic ferroviaire, basé sur le principe dit "MÉMOIRE ACTIVE".

Soutenue le : 18 JUIN 1971

devant la Commission d'Examen

| | | |
|---|---|---|
| MM. | SIMON | Président |
| | PICARD | Examinateur |
| | DEBRAINE | Examinateur |
| | GREMY | Examinateur |
| Dr. | SAUVAN | Examinateur |
| M. | MEYER | Membre invité |

**Figures**

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# L I V R E  I

## CONCEPTION d'une STRUCTURE "MEMOIRE ACTIVE"

UNIV.
LEIDEN
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# CHAPITRE 1

## Considérations sur l'intelligence artificielle

Fig. 14 a

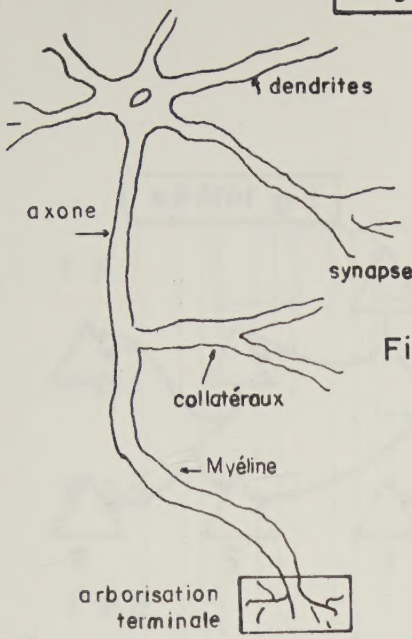
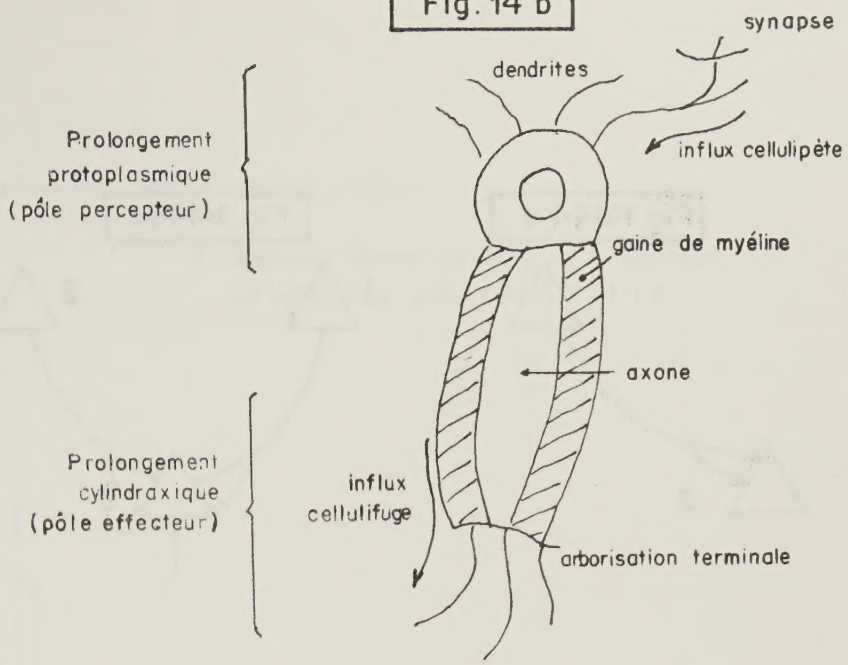



Fig. 14 a

Fig. 14 b




## Schéma de la théorie catènaire

Fig. 14 c

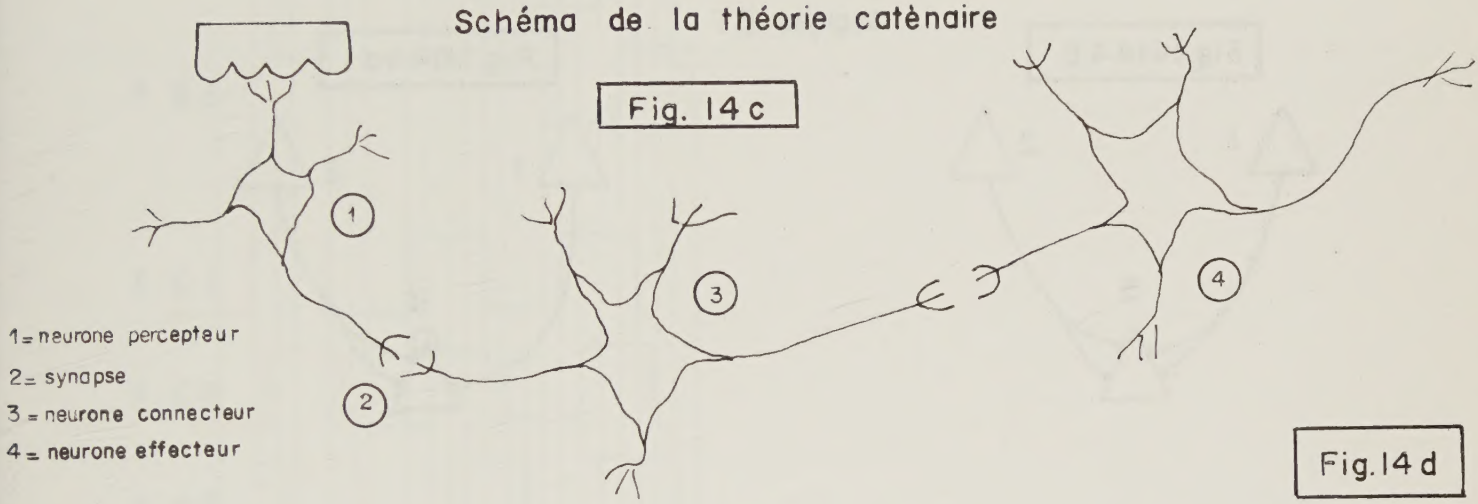
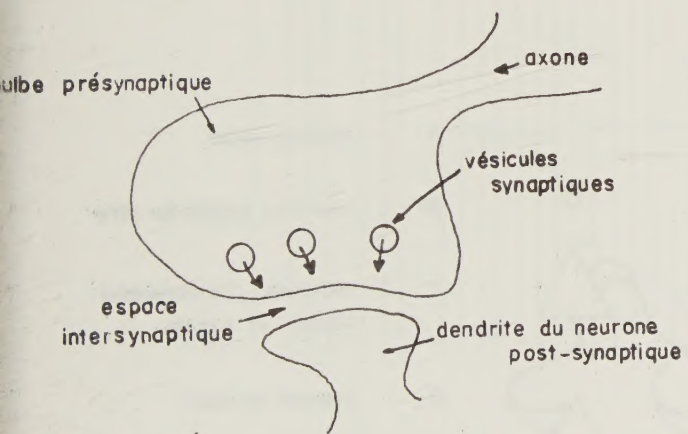



Fig. 14 d



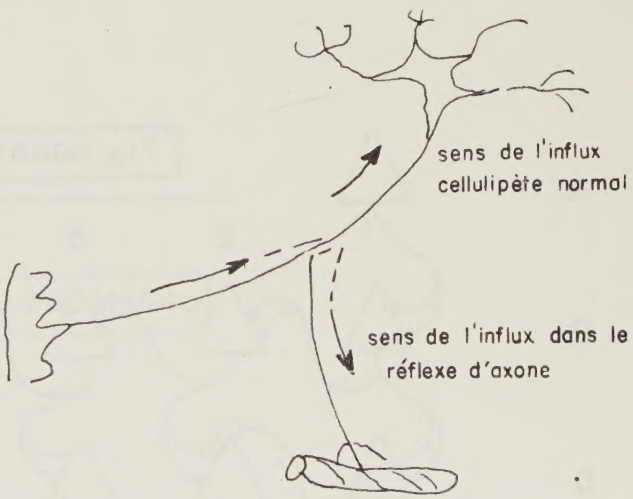




Fig. 14 e

Fig. 14144 a

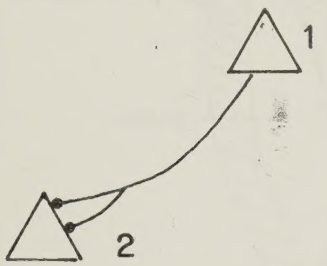
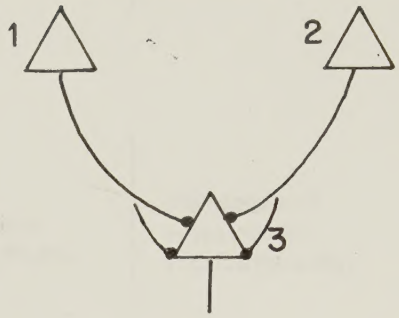



Fig. 14144 c

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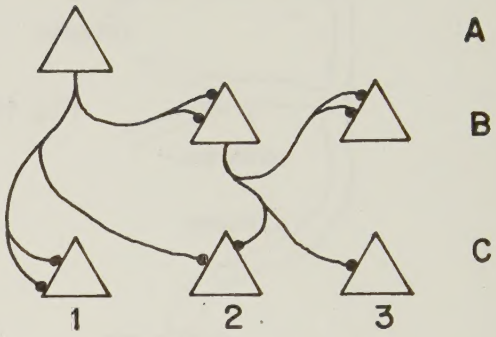



logique ET

Fig. 14144 b

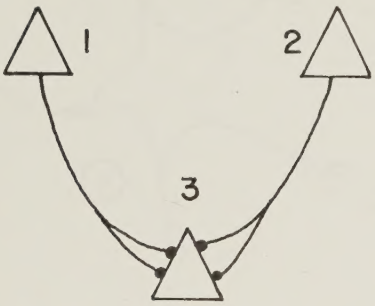



Fig. 14144 d

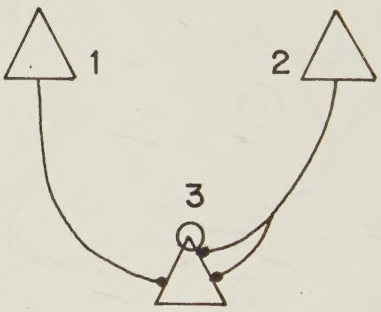
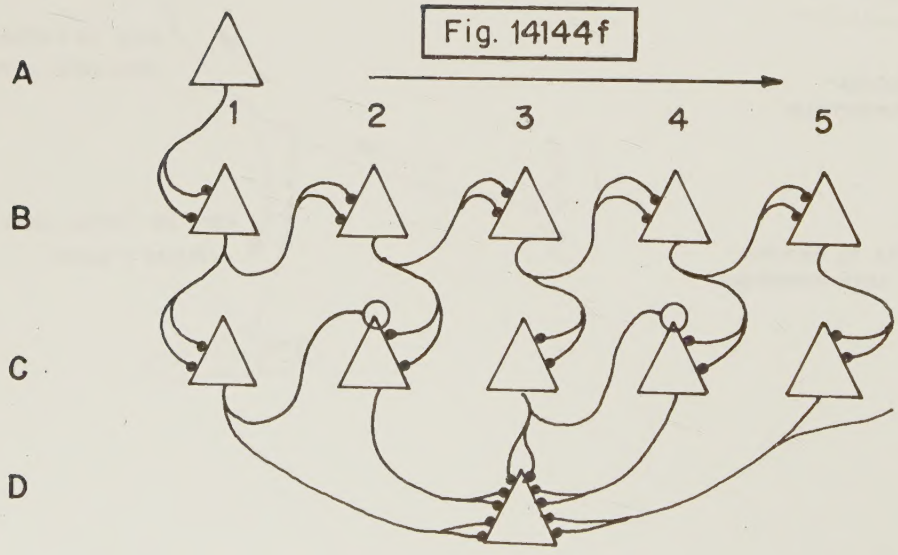



Fig. 14144 f




A : neurone initial

B : neurones excités en série

C : neurones alternativement inhibés et excités

D : neurone terminal

Fig.14144g

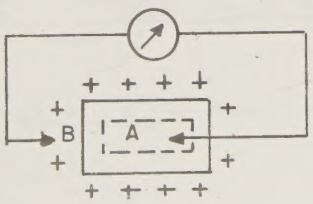
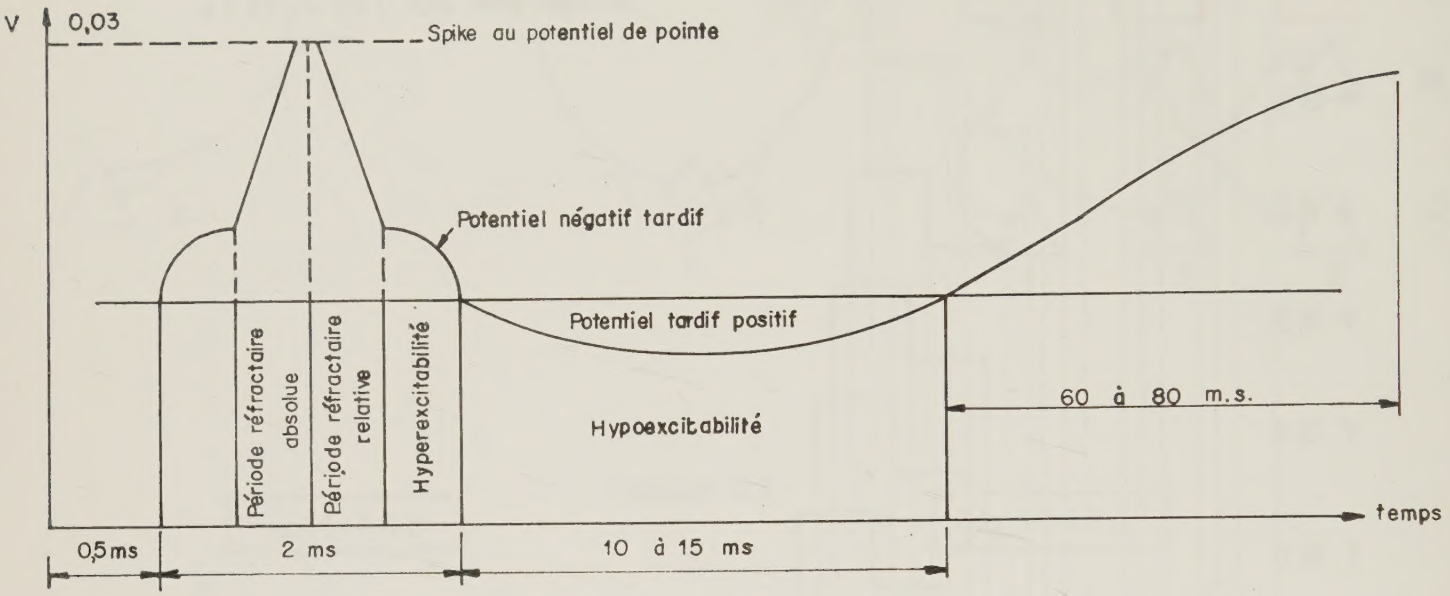



Fig. 1421a

Fig. 1422a **Cycle d'excitabilité du neurone, onde monophasique**



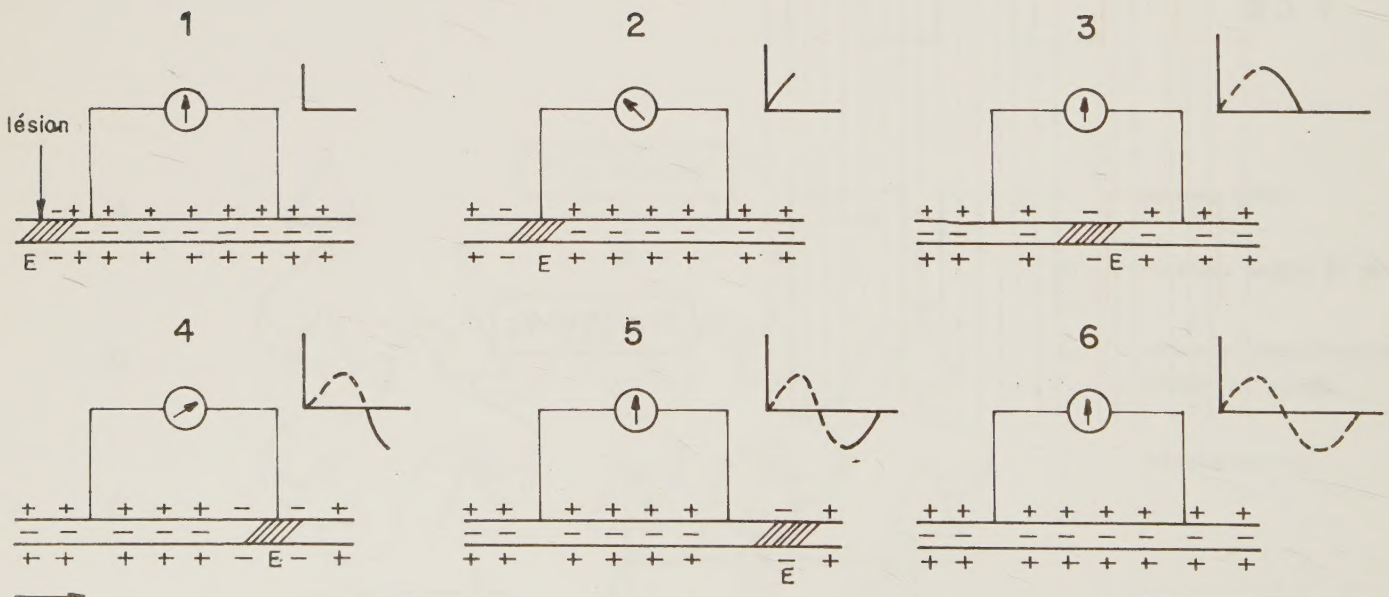




Fig. 142.3 a

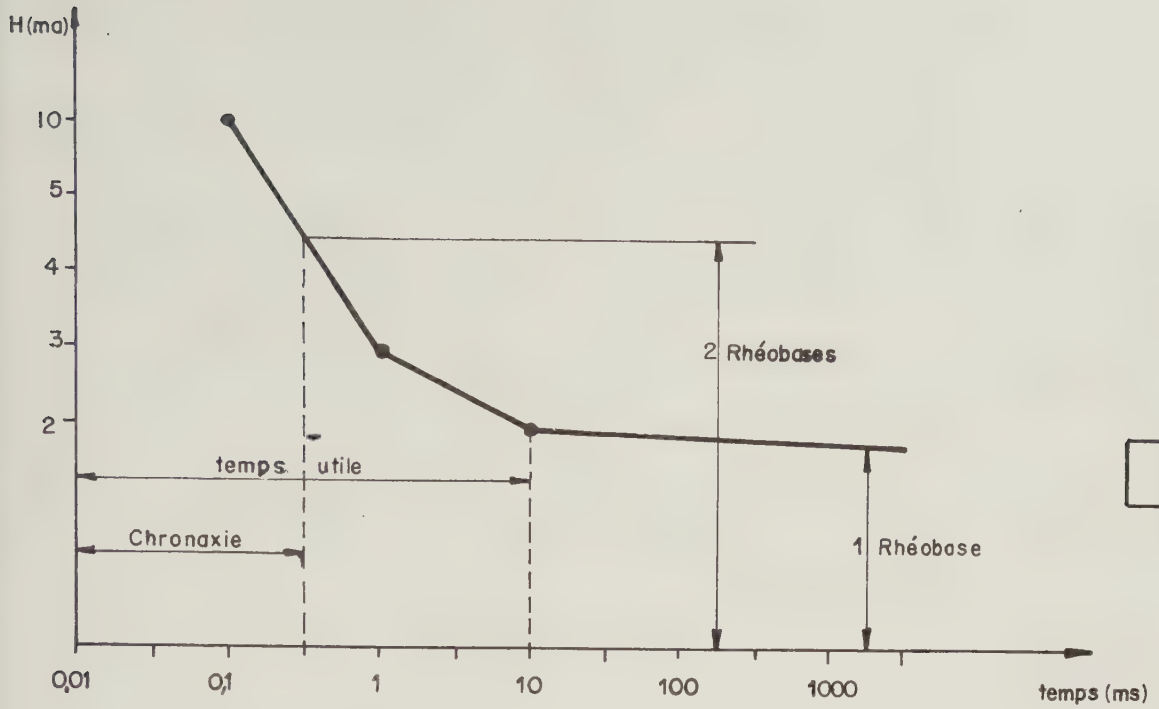
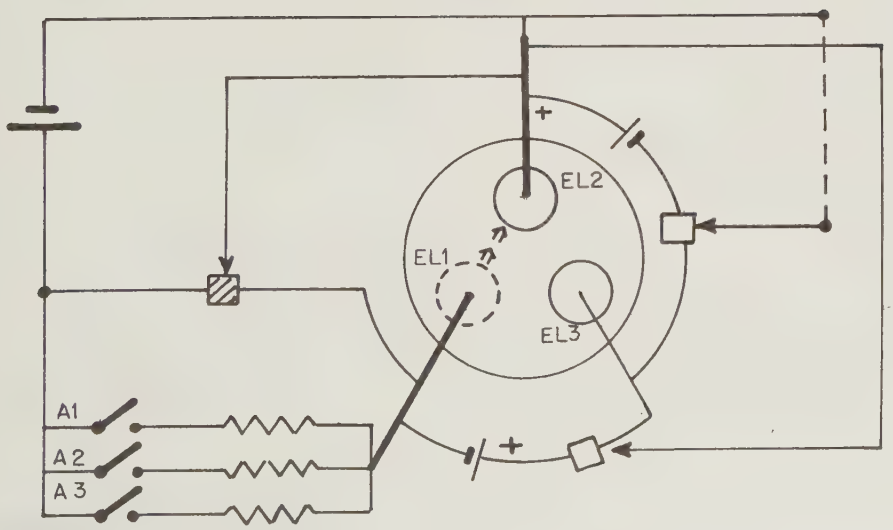



Fig. 142.3 b

Fig. 143.1 a

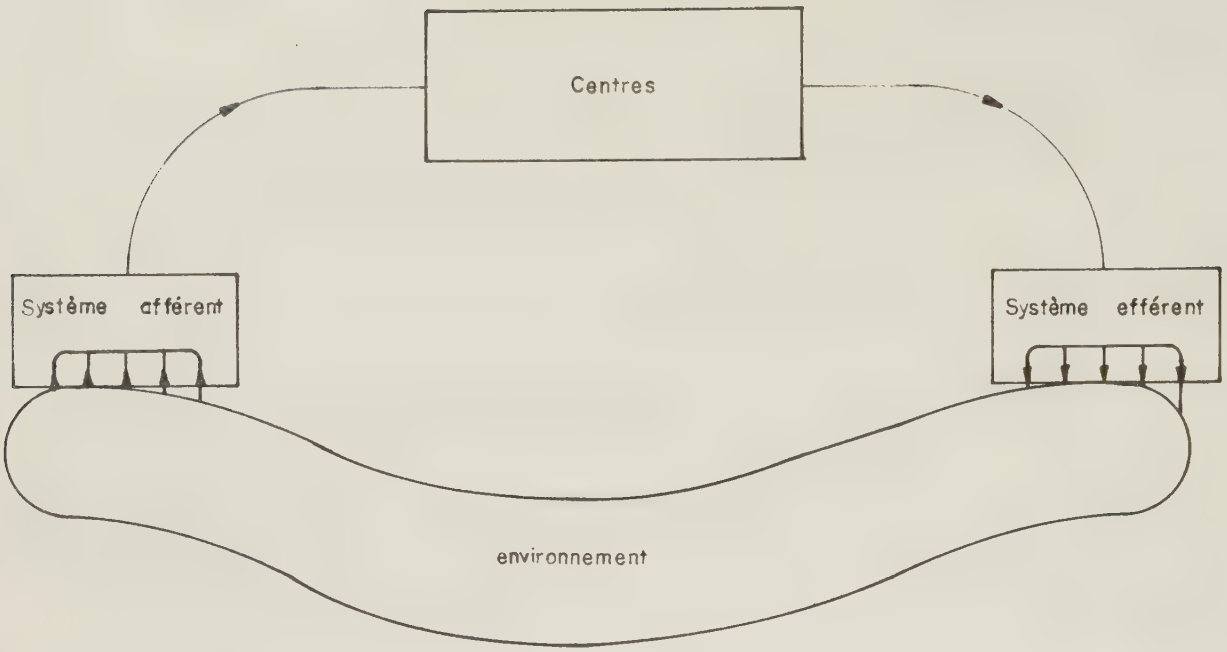


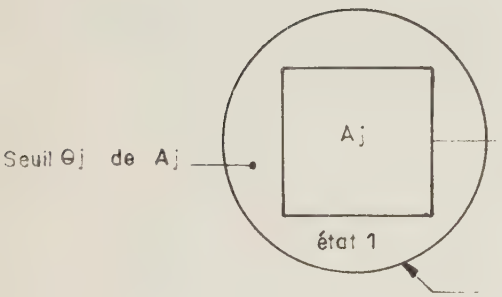

EL1 : Entrée

EL2 : Sortie

A1, A2, A3 : Afférence

Fig. 1441 a




Vij

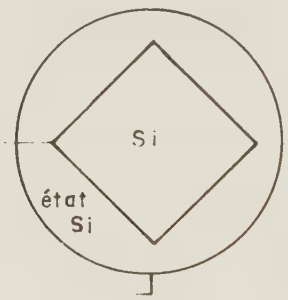
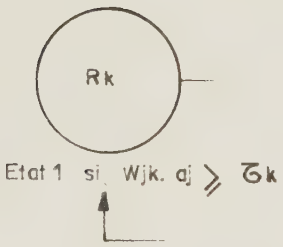



Fig. 145 a




W jk

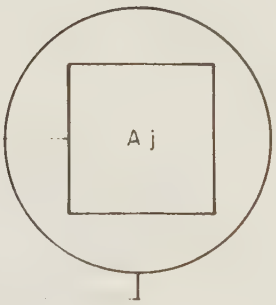



Fig. 145 b

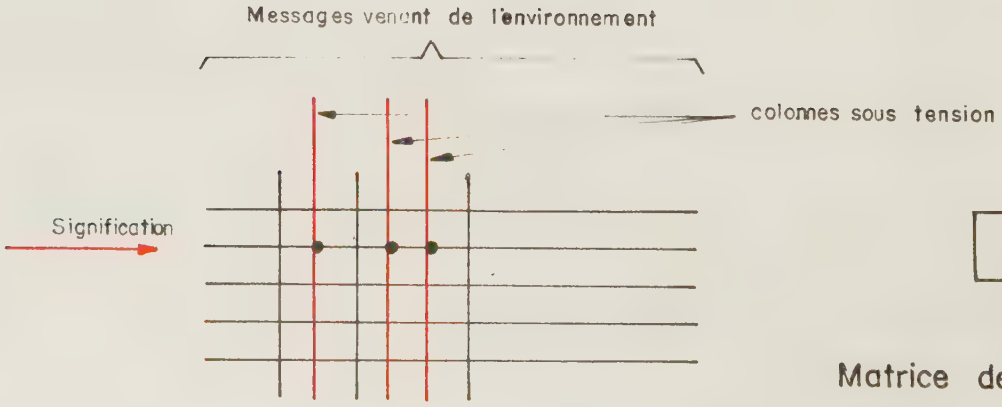


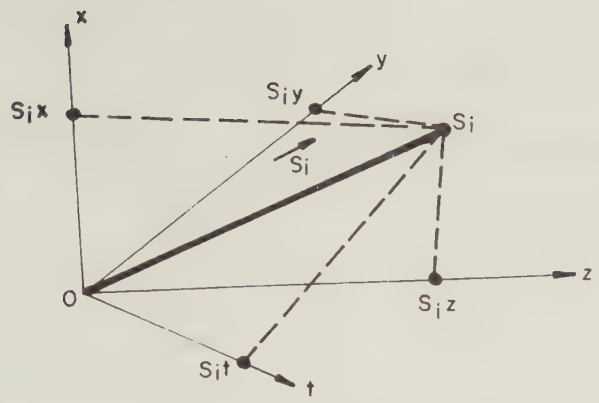

Fig. 145 c

Matrice de Steinbuch

# CHAPITRE 2

## Les structures "Mémoires Actives" du Dr. SAUVAN

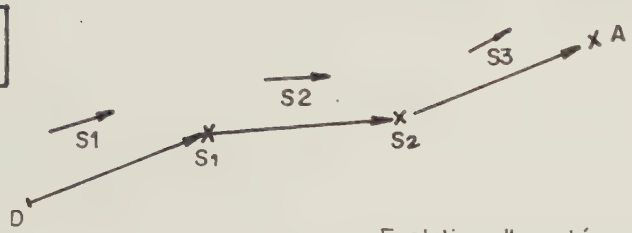
Fig. 232 a




x
y
z
t
} variables

Sx
Sy
Sz
St
} état des variables ou élément de situation

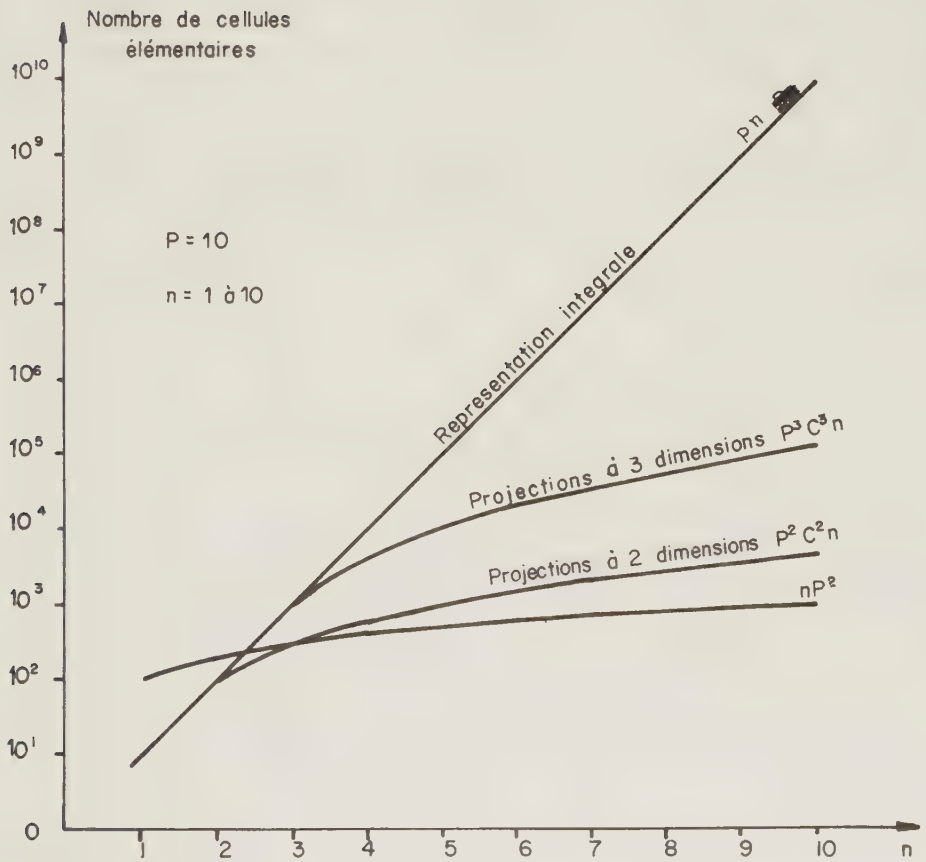
Fig. 232 b




La suite des vecteurs $\overrightarrow{S1}, \overrightarrow{S2}, \overrightarrow{S3}$ forme la trajectoire du point D au point A notée $\overline{DTA}$

Evolution d'un phénomène

Fig. 2335 a



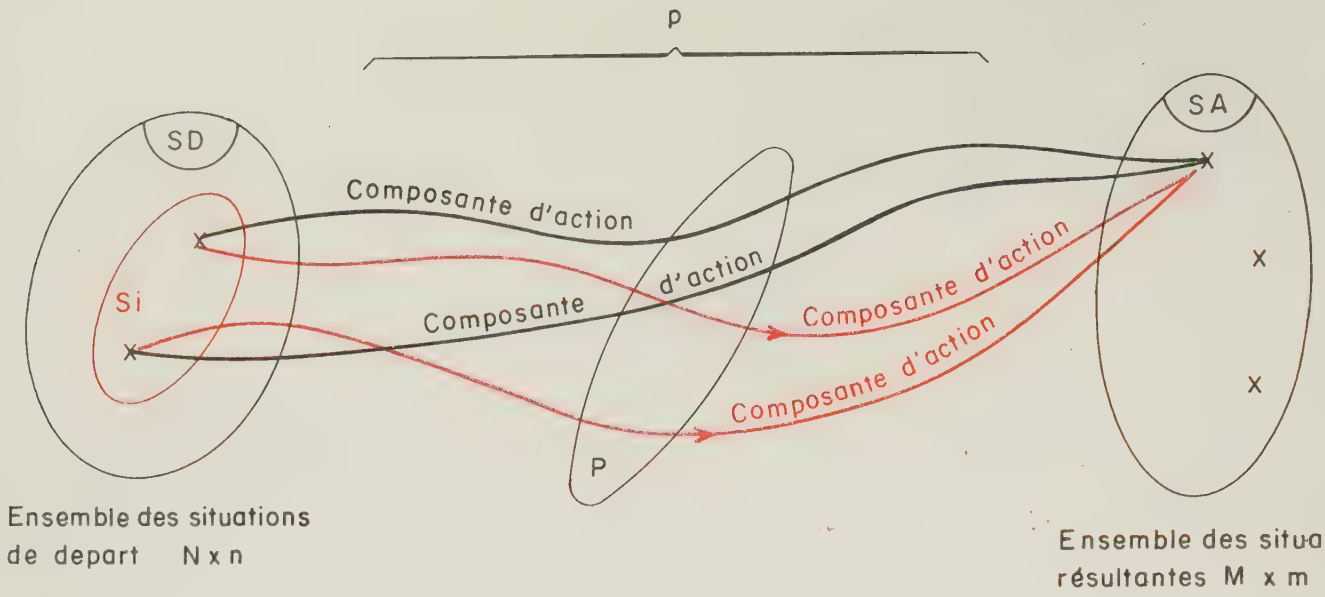



Figure 2333 a

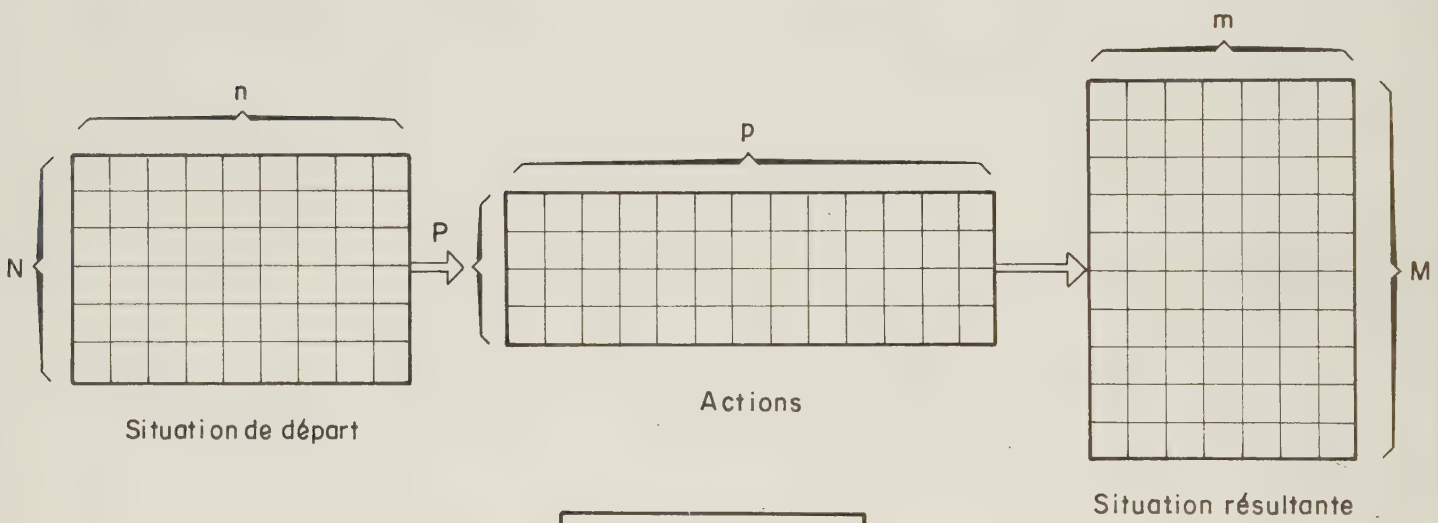



Figure 2333 b

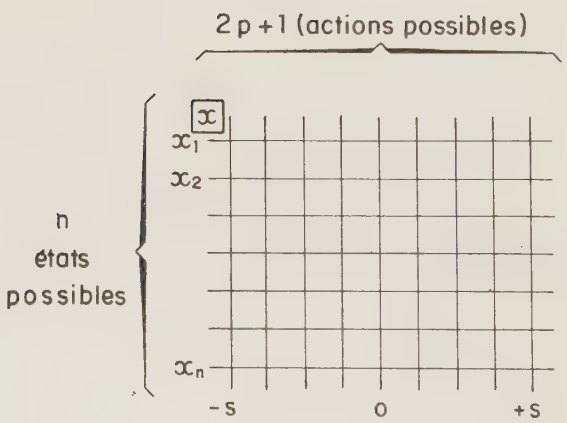



Figure 234 a
(Centre inscription)

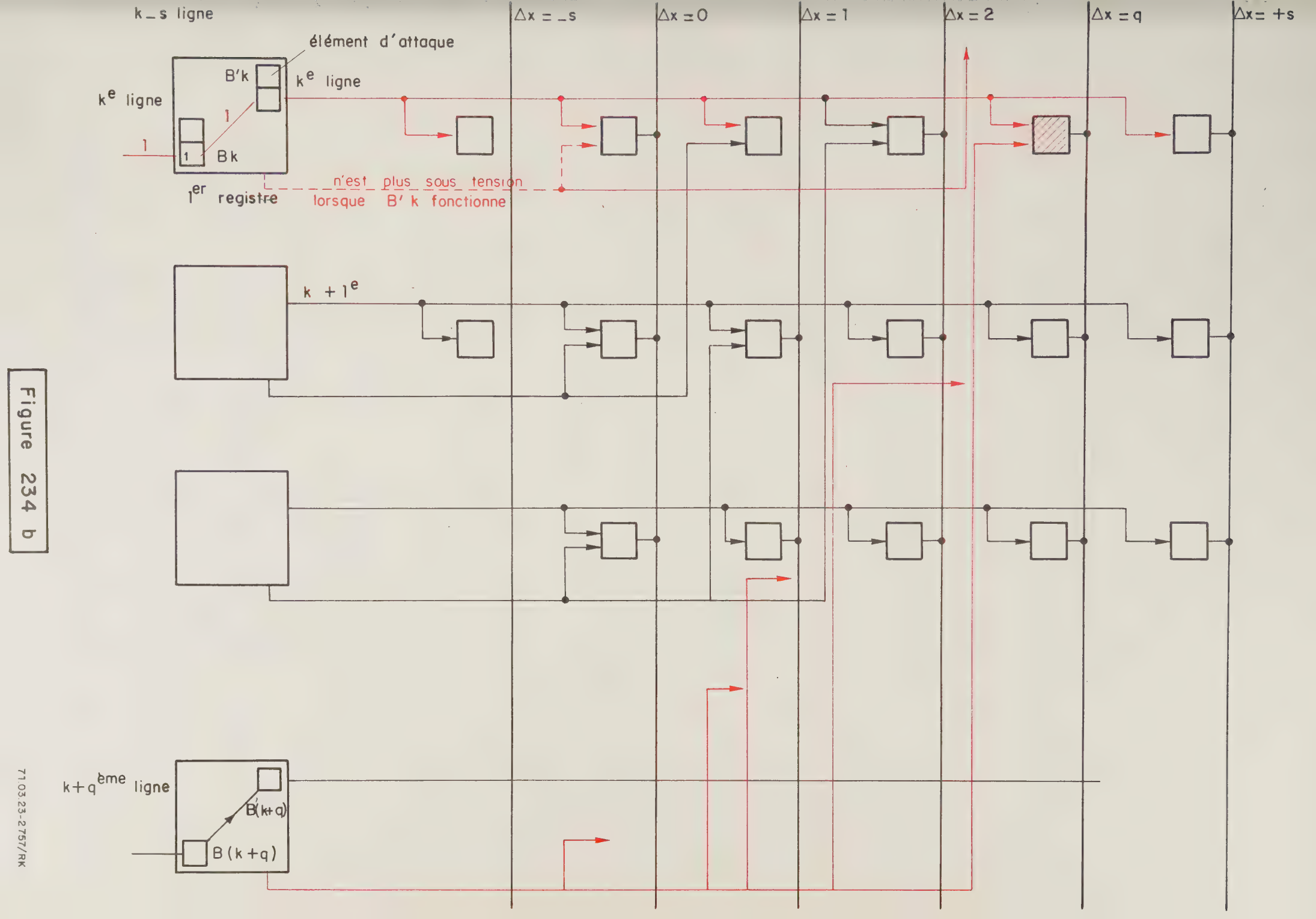



Figure 234 b

71.03.23-2757/RK

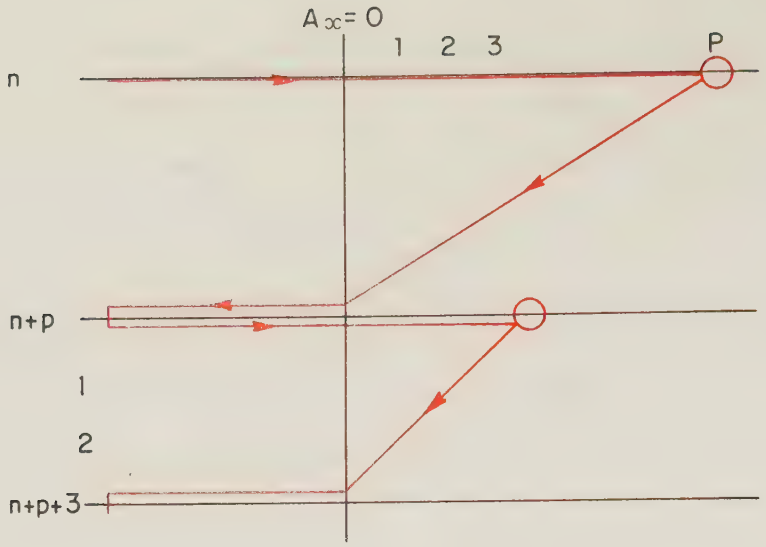



Figure 234 c

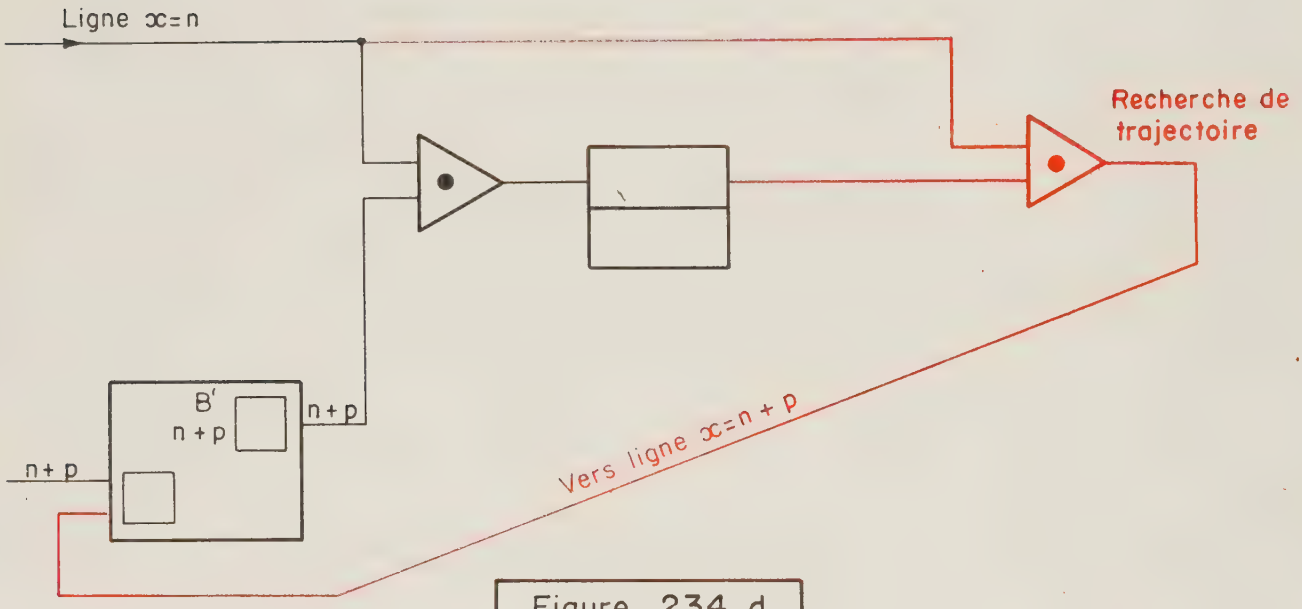



Figure 234 d

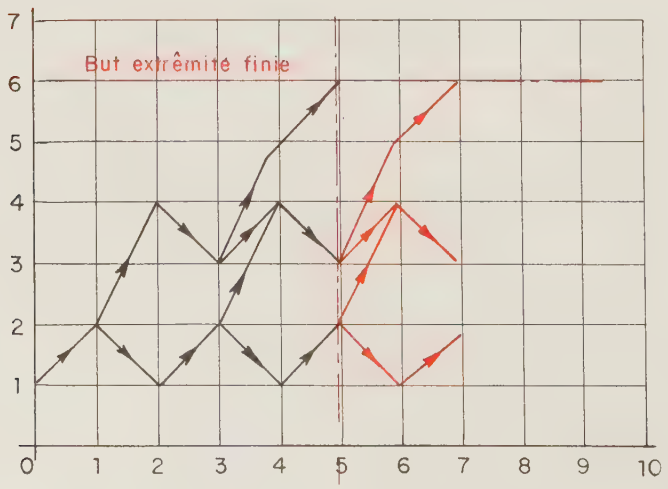



Figure 234 e

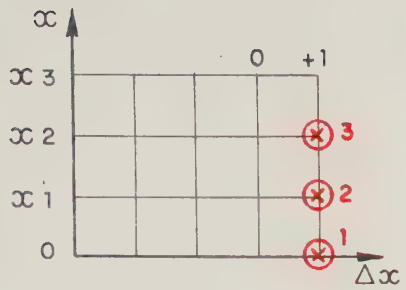



Figure 234 g

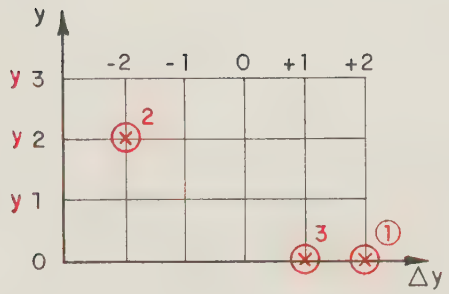



Figure 234 h

Etat des CI apres inscription des données de la trajectoire

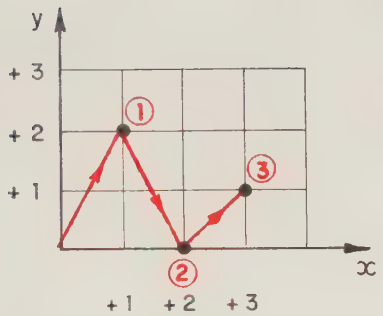



Figure 234 f

Trajectoire à inscrire

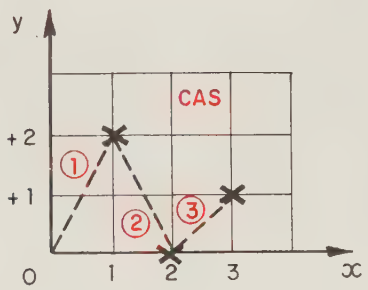



Figure 234 k

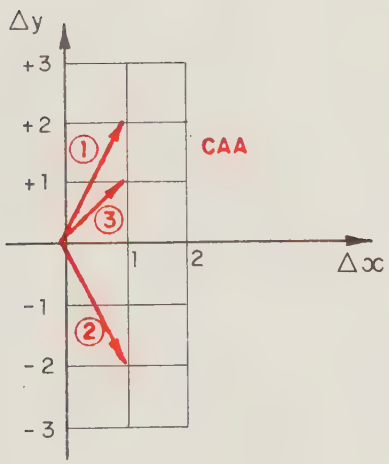



Figure 234 ℓ

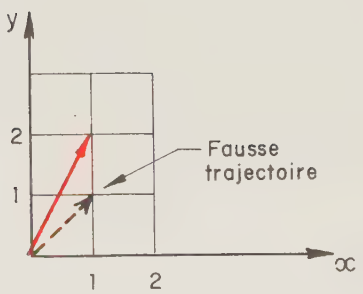
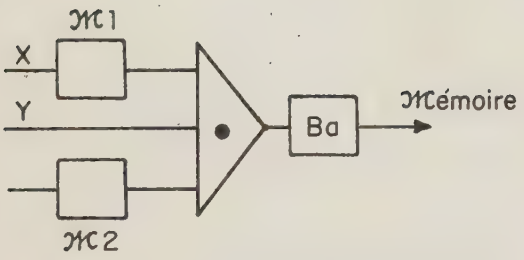



Figure 234 j




m1, m2 mémoires temporaires

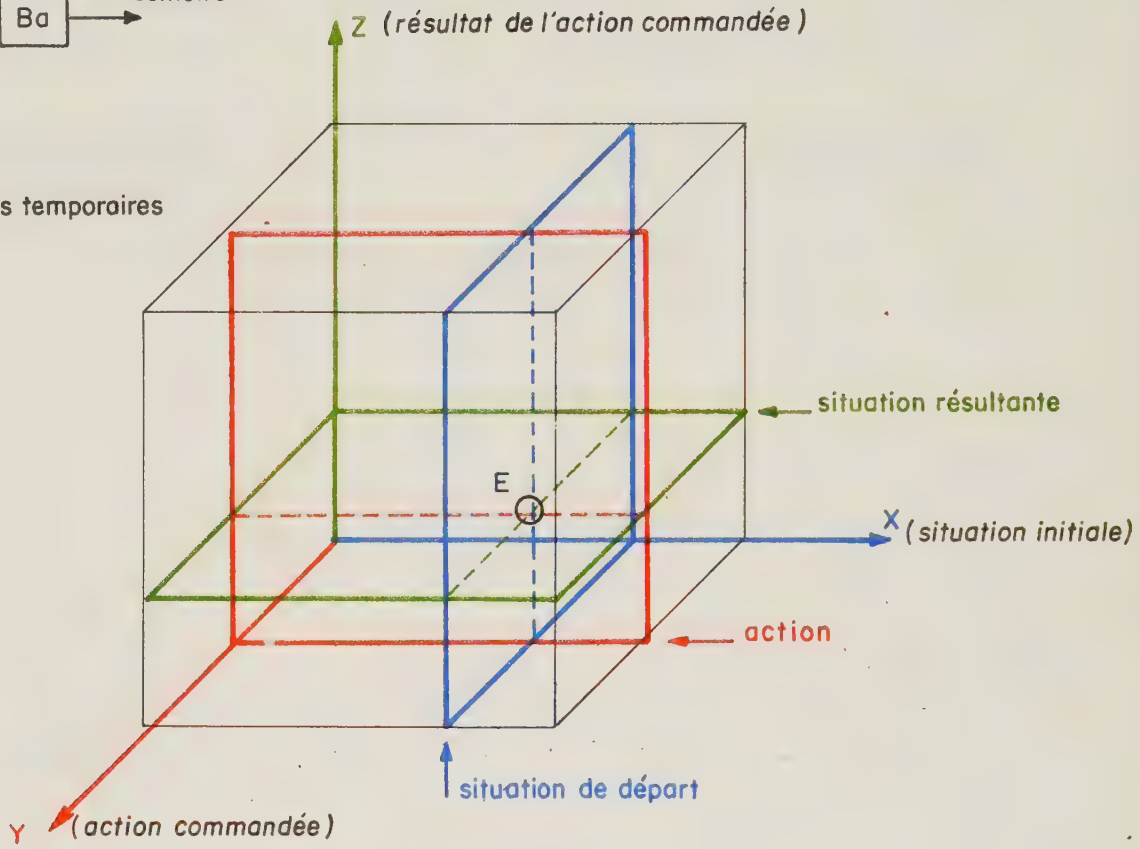
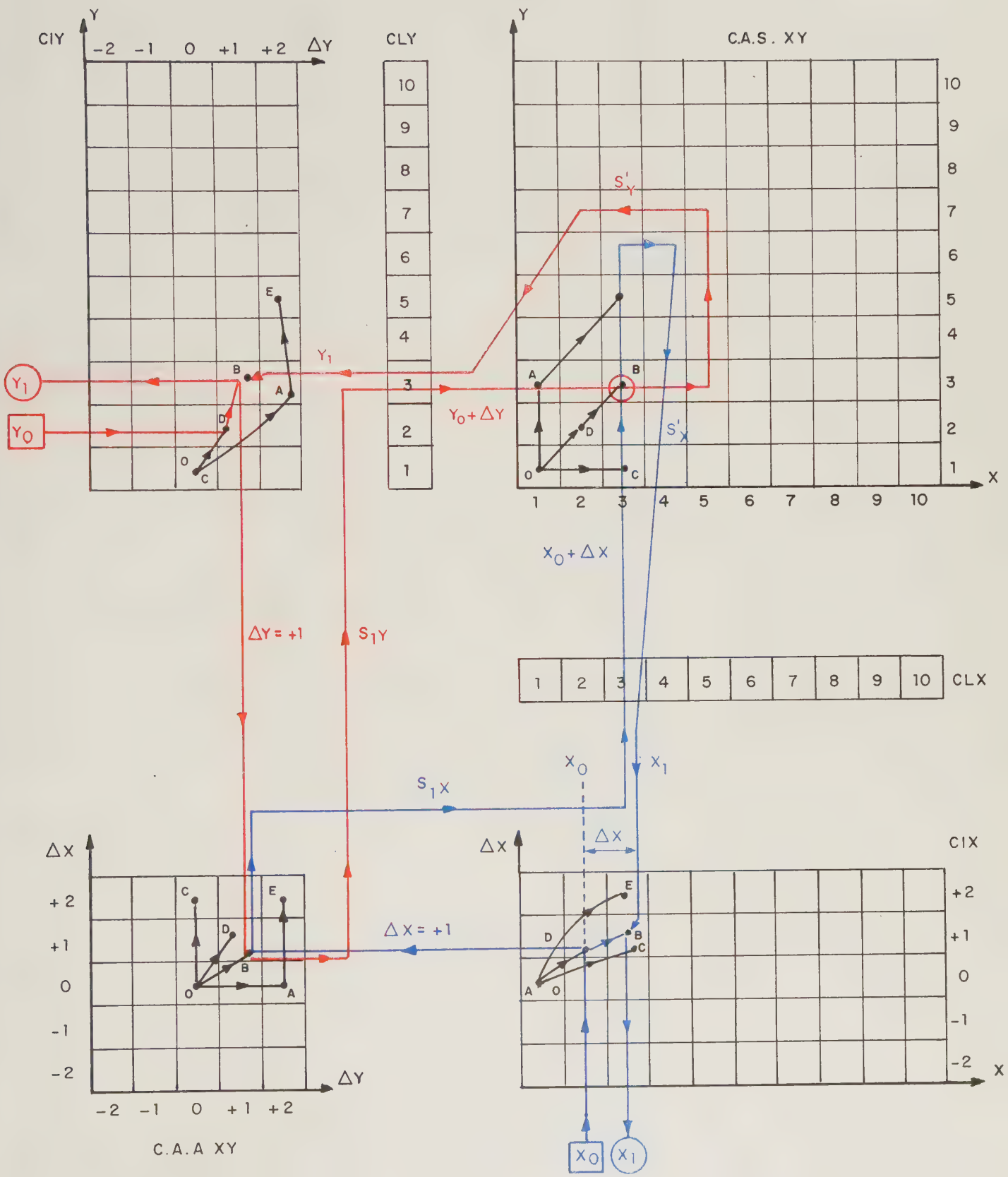



Figure 23411 b

Figure 2343a



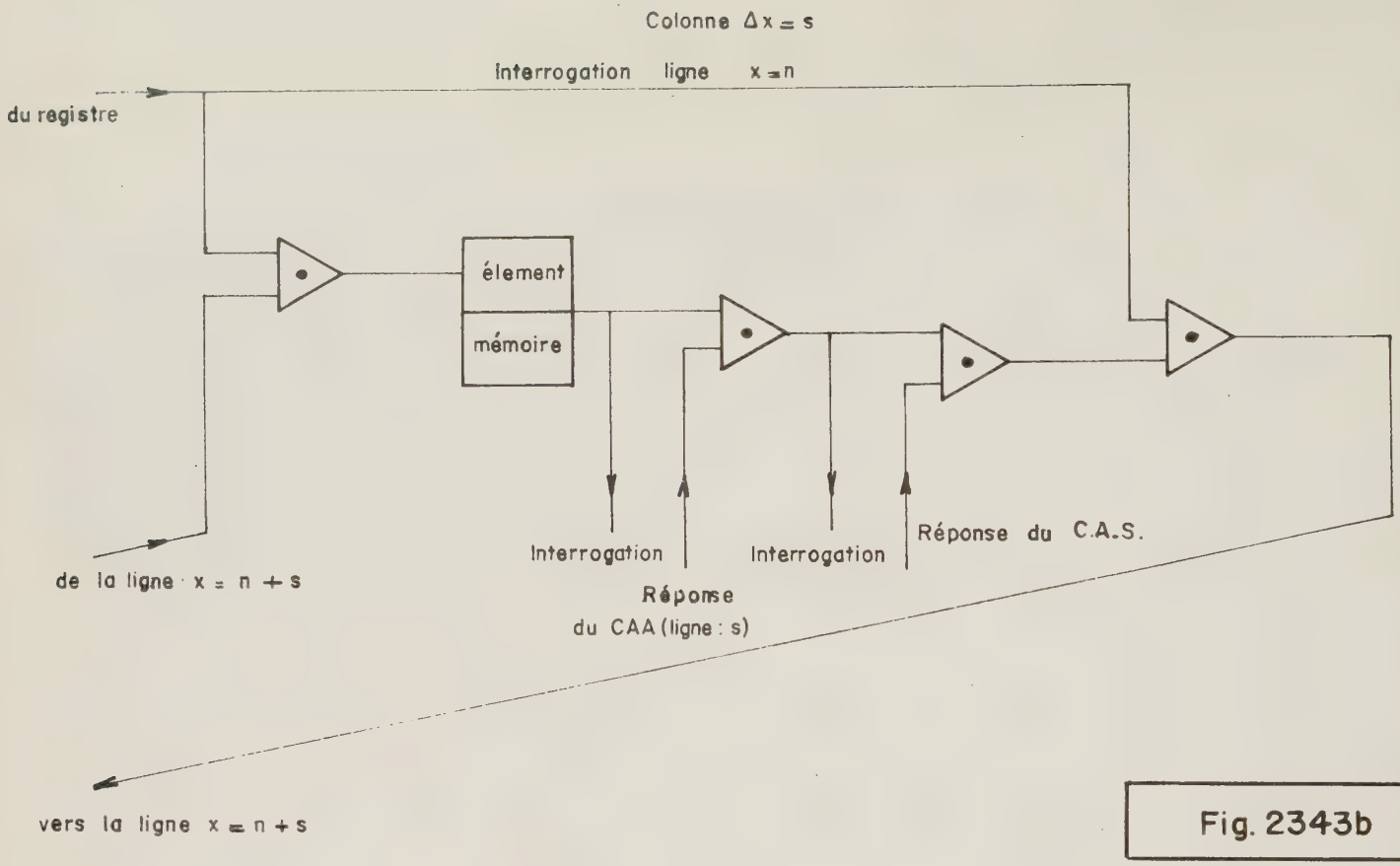



Fig. 2343b

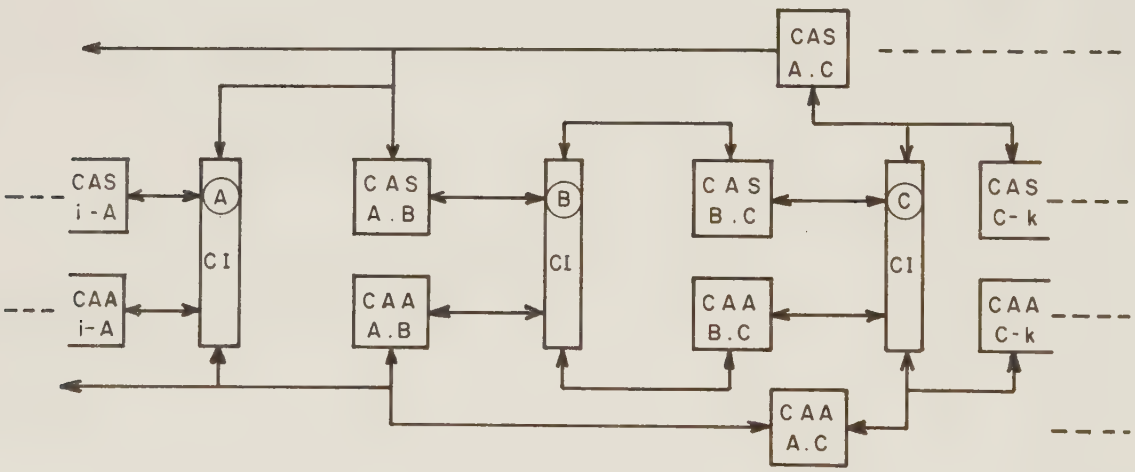



Fig. 2344 a

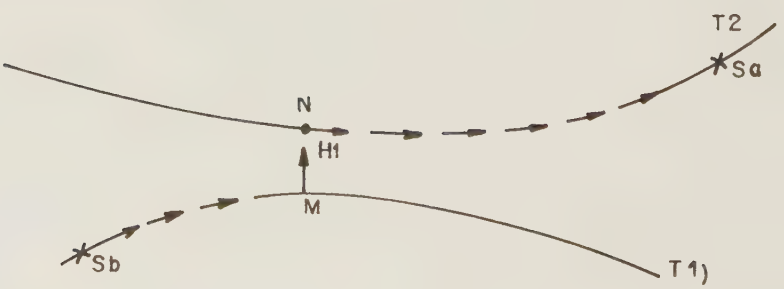



Fig. 2345a

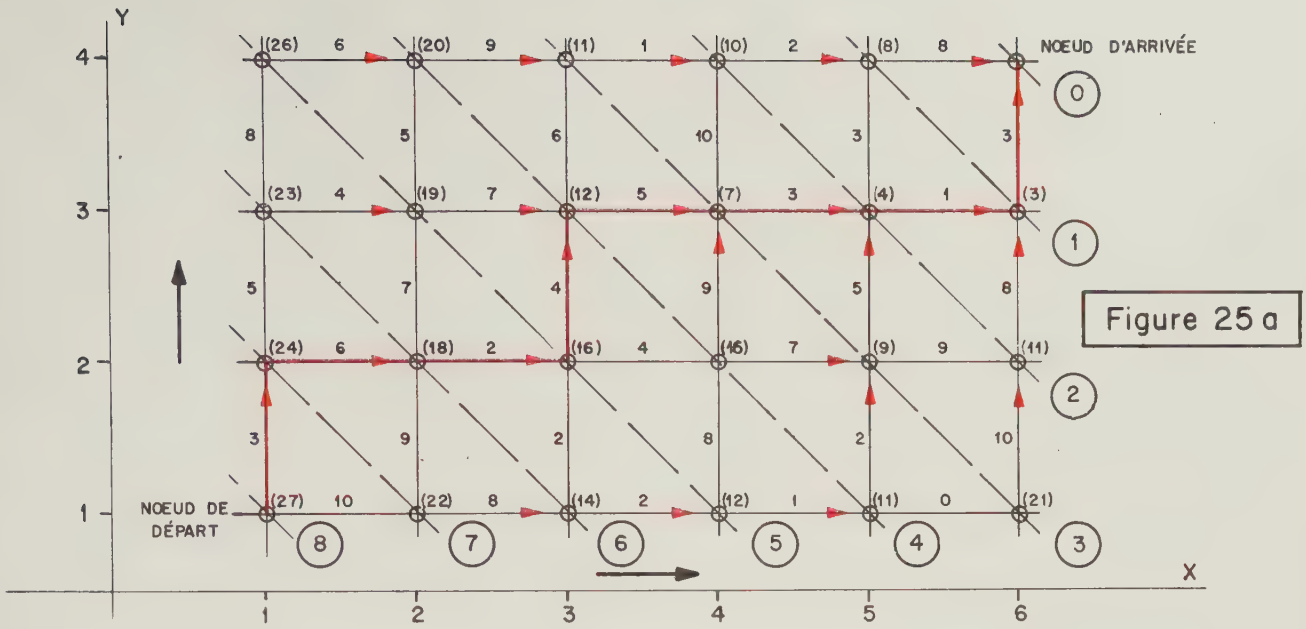

Y
X
NŒUD D'ARRIVÉE
NŒUD DE DÉPART
(26) 6 (20) 9 (11) 1 (10) 2 (8) 8
(23) 4 (19) 7 (12) 5 (7) 3 (4) 1 (3)
(24) 6 (18) 2 (16) 4 (16) 7 (9) 9 (11)
(27) 10 (22) 8 (14) 2 (12) 1 (11) 0 (21)
8 5 6 10 3 3
5 7 4 9 5 8
3 9 2 8 2 10
0 1 2 3 4 5 6 7 8

Figure 25 a

# CHAPITRE 3

## Les domaines d'application possibles des structures "Mémoires Actives"

Fig. 325a

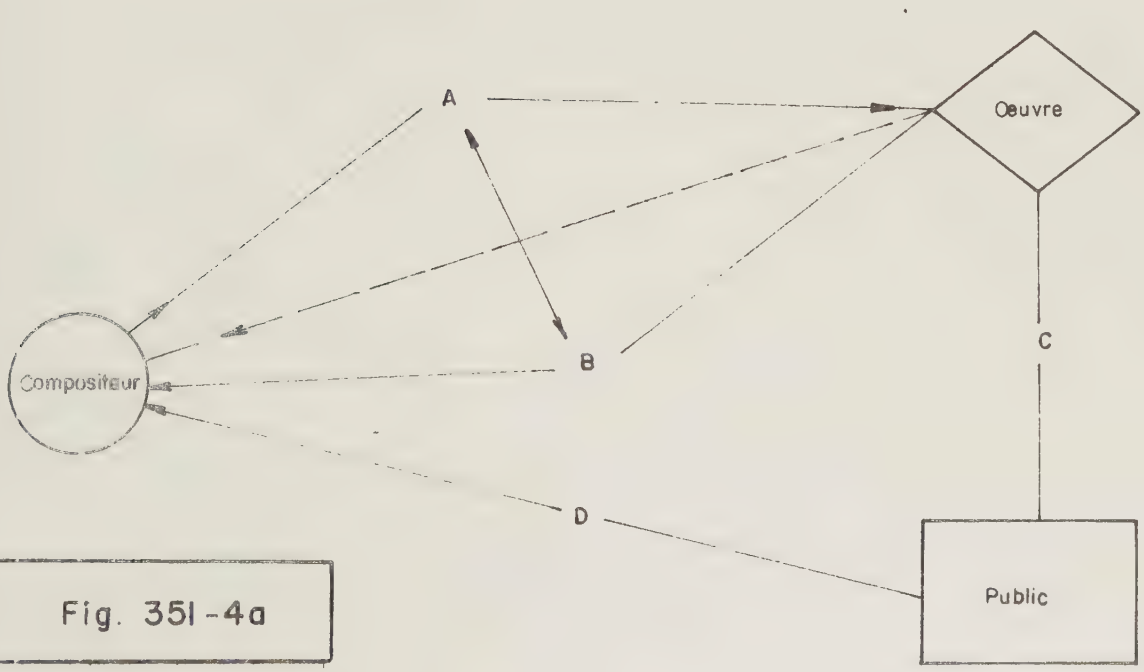



Fig. 351-4a

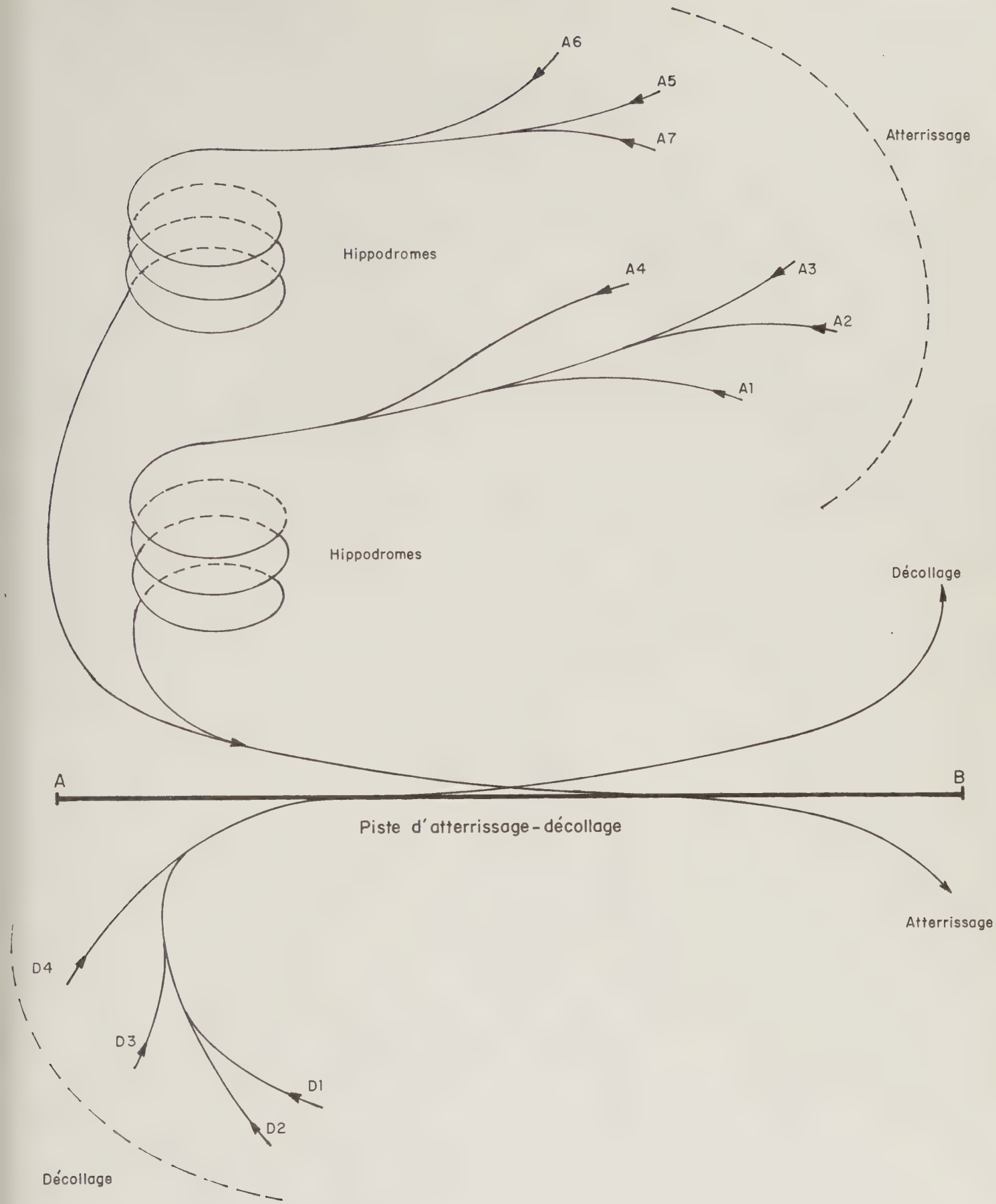
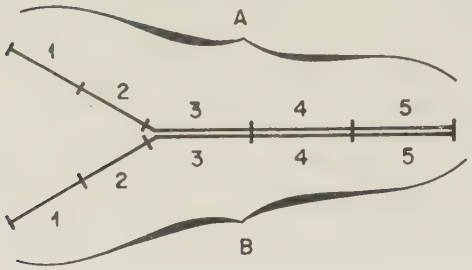
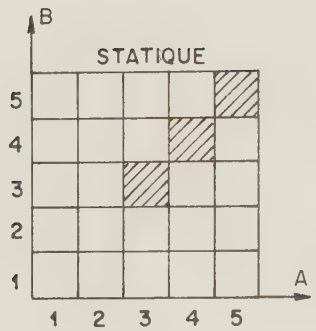


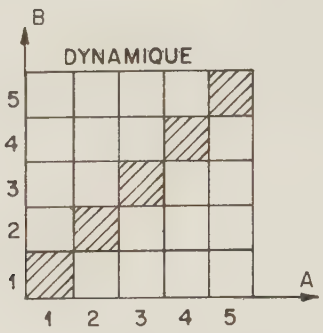

Figure 3426a

Figure 374 a




(I)




(II)

Figure 374 b

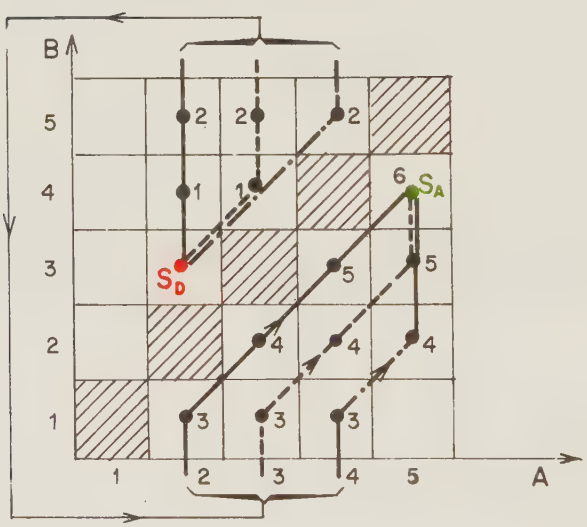



Figure 374 c

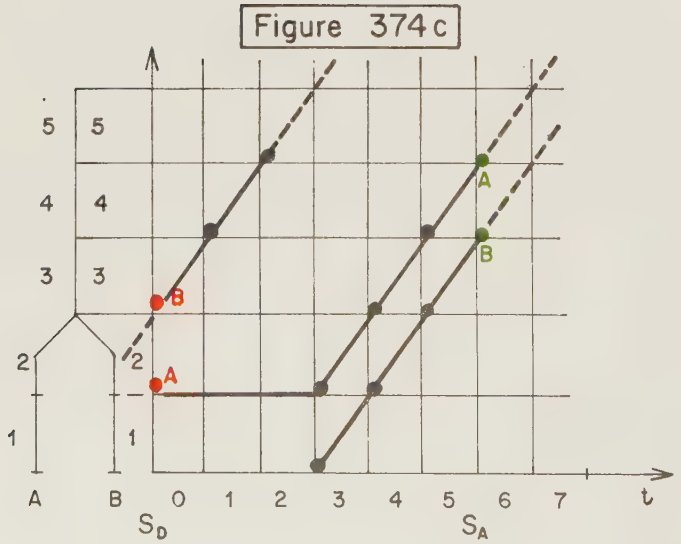



Figure 374 d

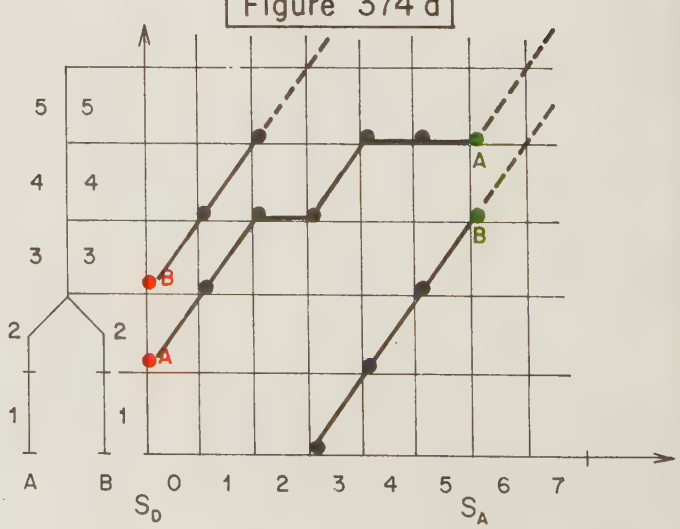


Figure 375 a

Configuration voie unique

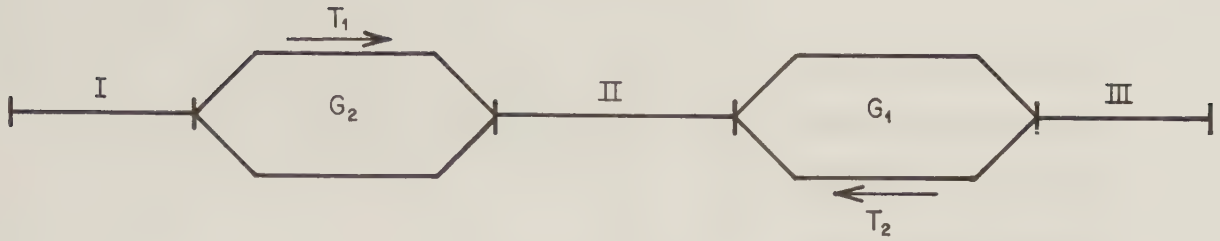



Figure 375 b

Diagramme des marches

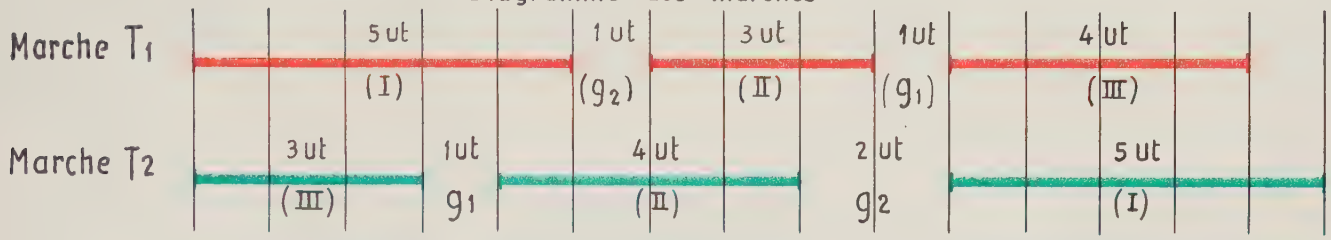



Figure 375 c

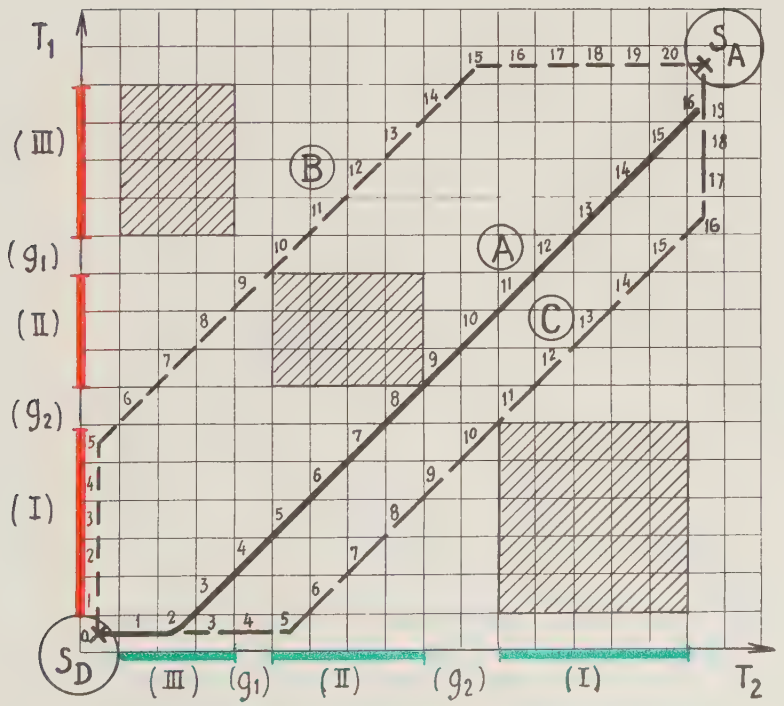


Figure 376 a

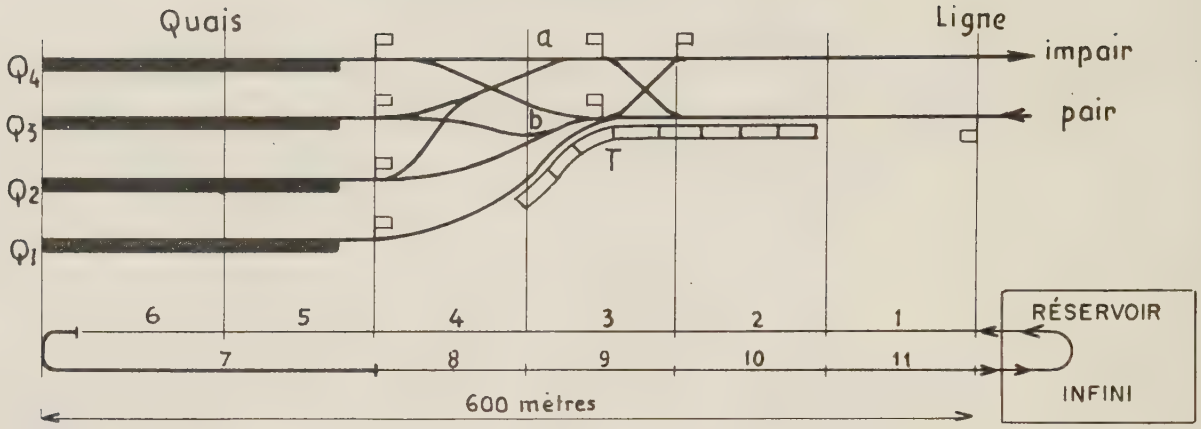
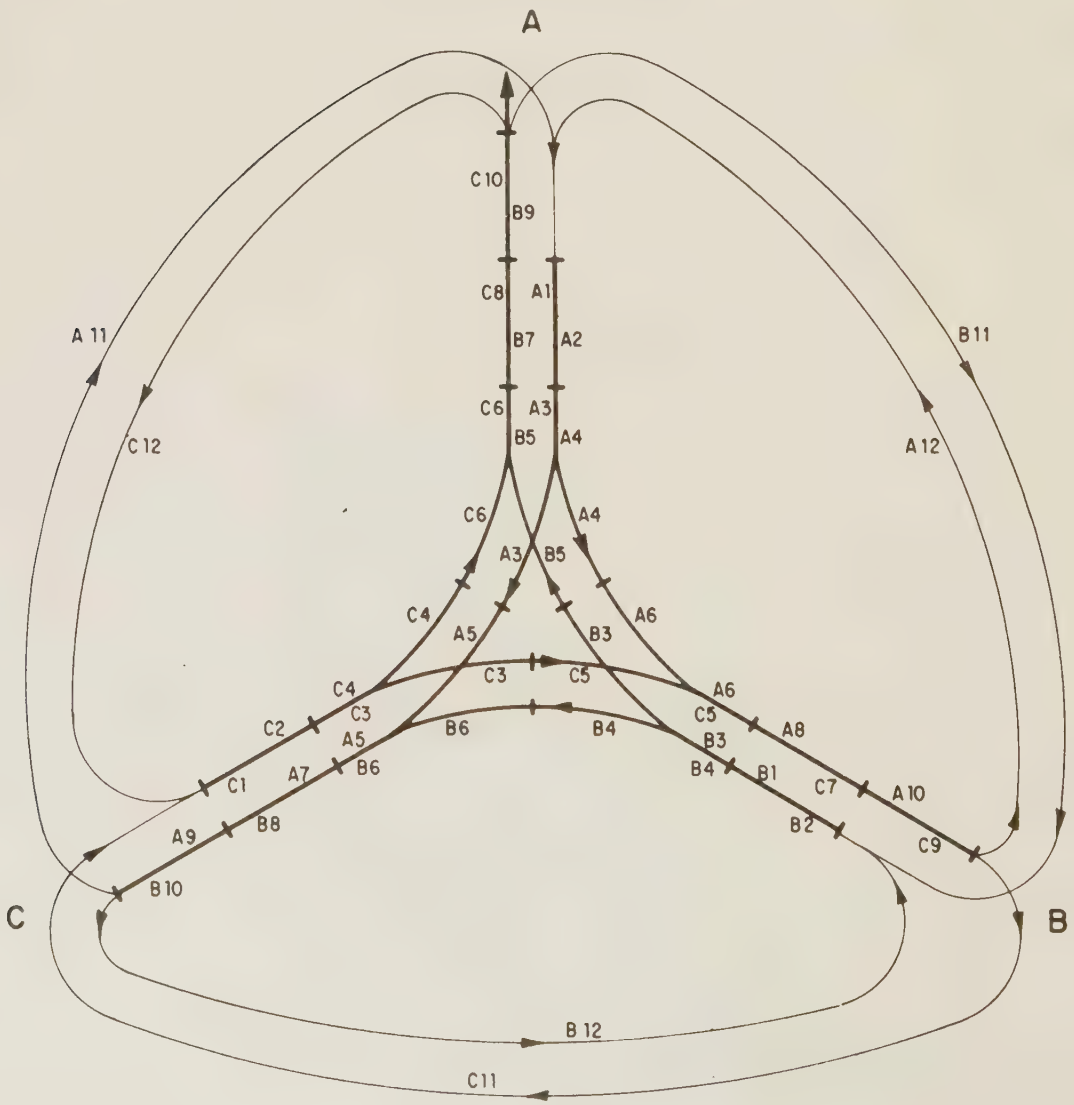



Figure 377 a



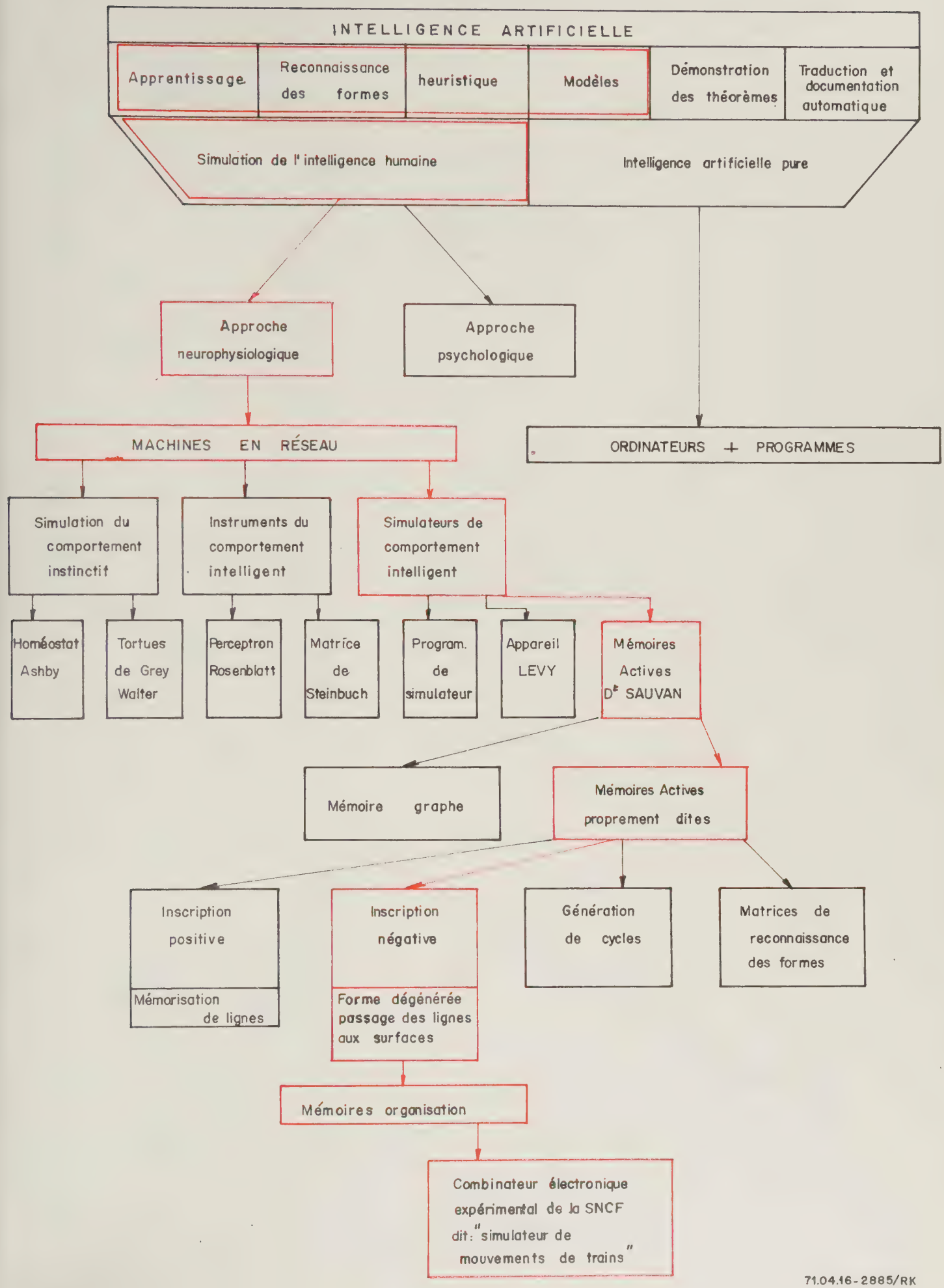
# L I V R E  II

APPLICATION des PRINCIPES "MEMOIRE ACTIVE"
à un COMBINATEUR ELECTRONIQUE EXPERIMENTAL pour la S.N.C.F.

# CHAPITRE 4

## *Le combinateur électronique expérimental de la S.N.C.F.*

## 4.2 _ Position du combinateur expérimental SNCF dans l'organigramme des structures " Mémoires Actives " et de l'intelligence artificielle




71.04.16-2885/RK

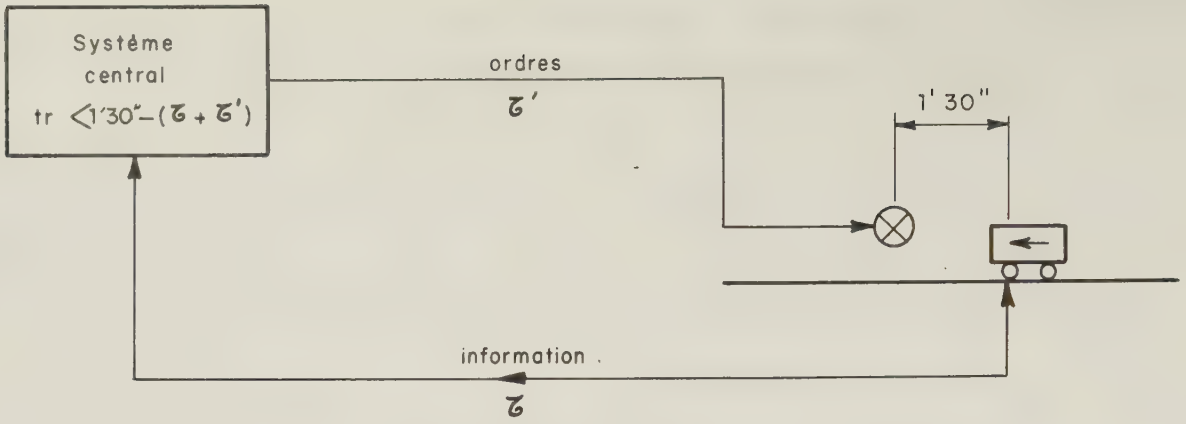



Figure 431 a

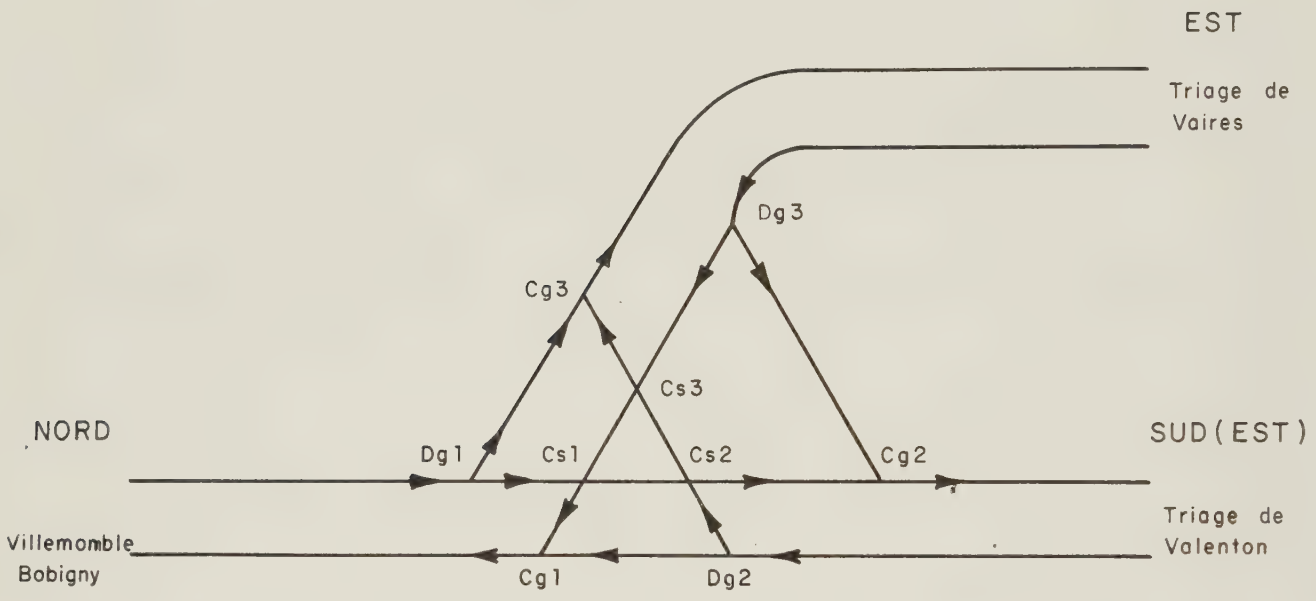



Figure 432 a

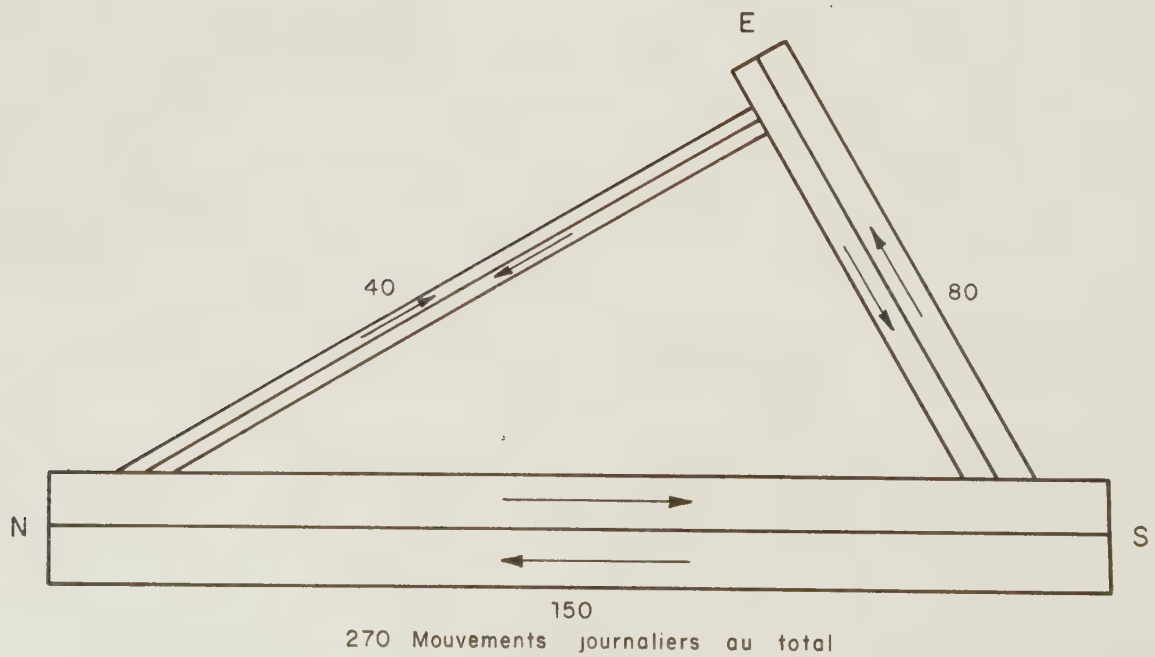



Figure 432 b

Figure 432 c1

Densité horaire moyenne du JEUDI

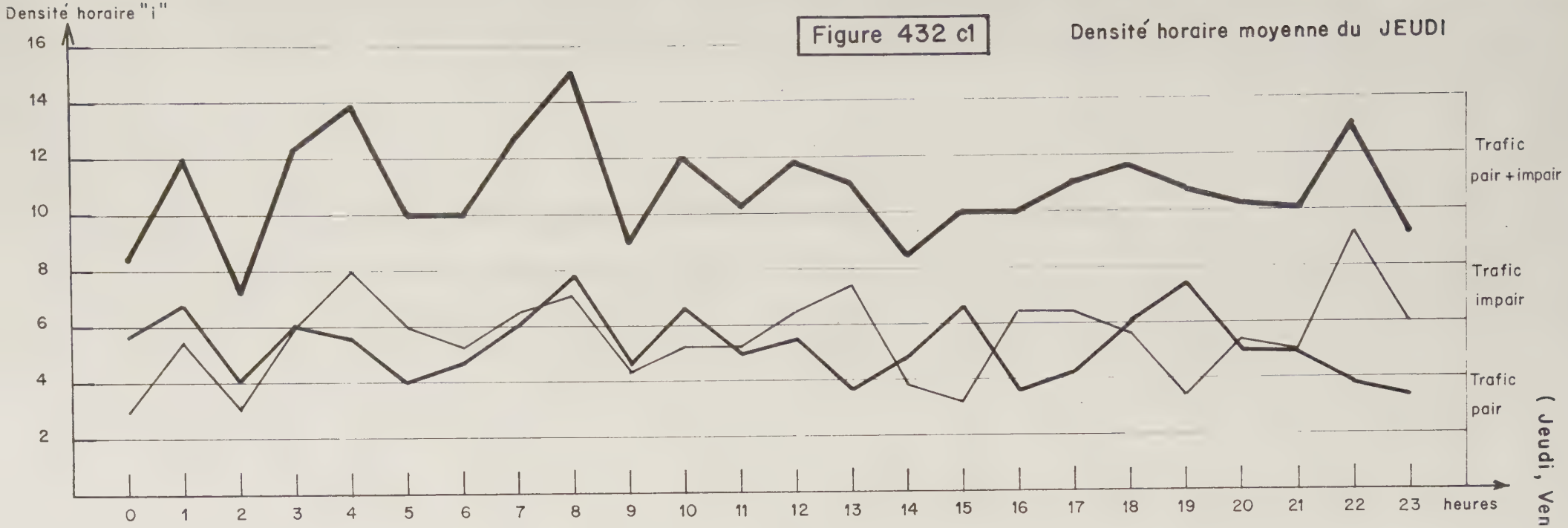
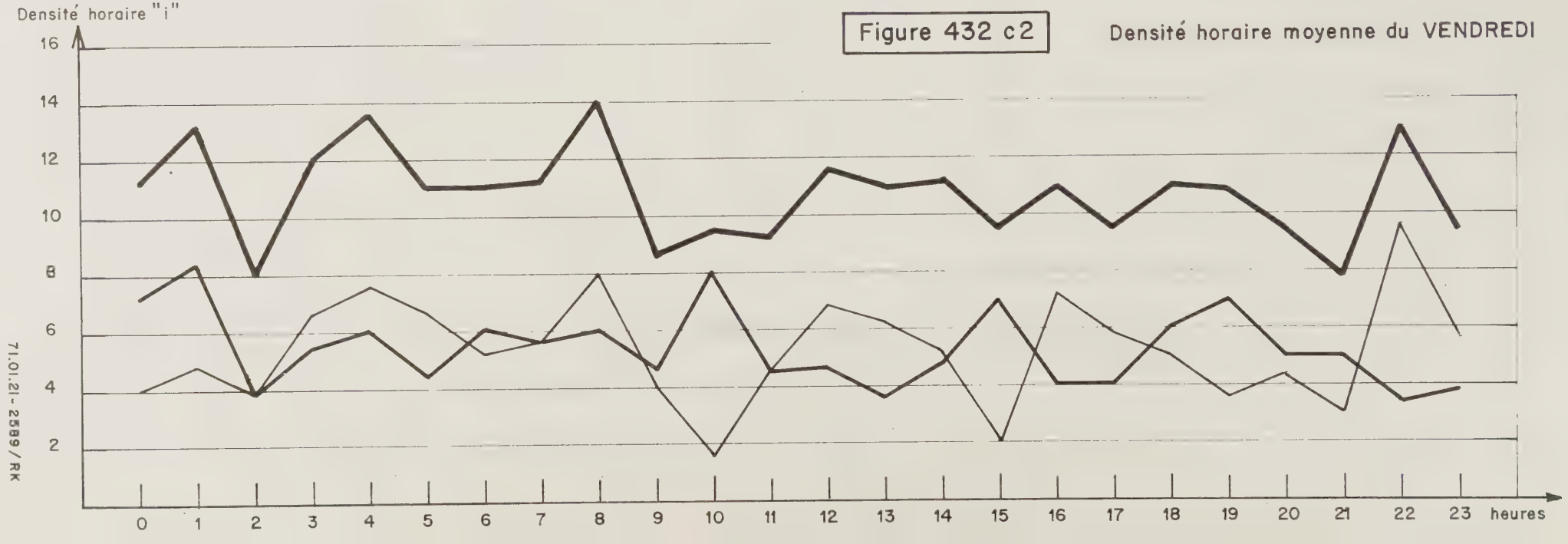



Figure 432 c2

Densité horaire moyenne du VENDREDI




RÉPARTITION HORAIRE DU TRAFIC À GAGNY

( Jeudi, Vendredi, Samedi, Dimanche )

71.01.21 - 2589 / RK

Densité horaire "i"

16
14
12
10
8
6
4
2

Figure 432 c3 : Densité horaire moyenne du SAMEDI

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 heures

Densité horaire "i"

16
14
12
10
8
6
4
2

Figure 432 c4 : Densité horaire moyenne du DIMANCHE

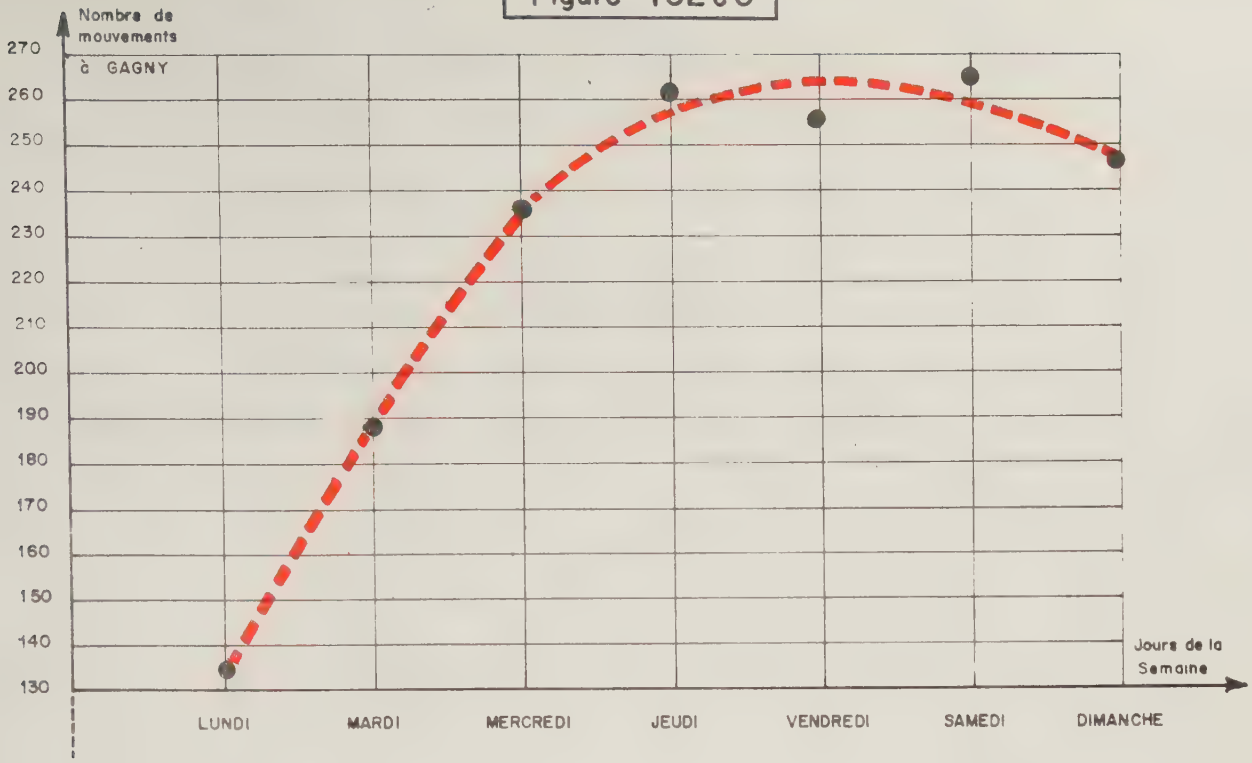
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 heures

RÉPARTITION HORAIRE DU TRAFIC À GAGNY

( Jeudi, Vendredi, Samedi, Dimanche )

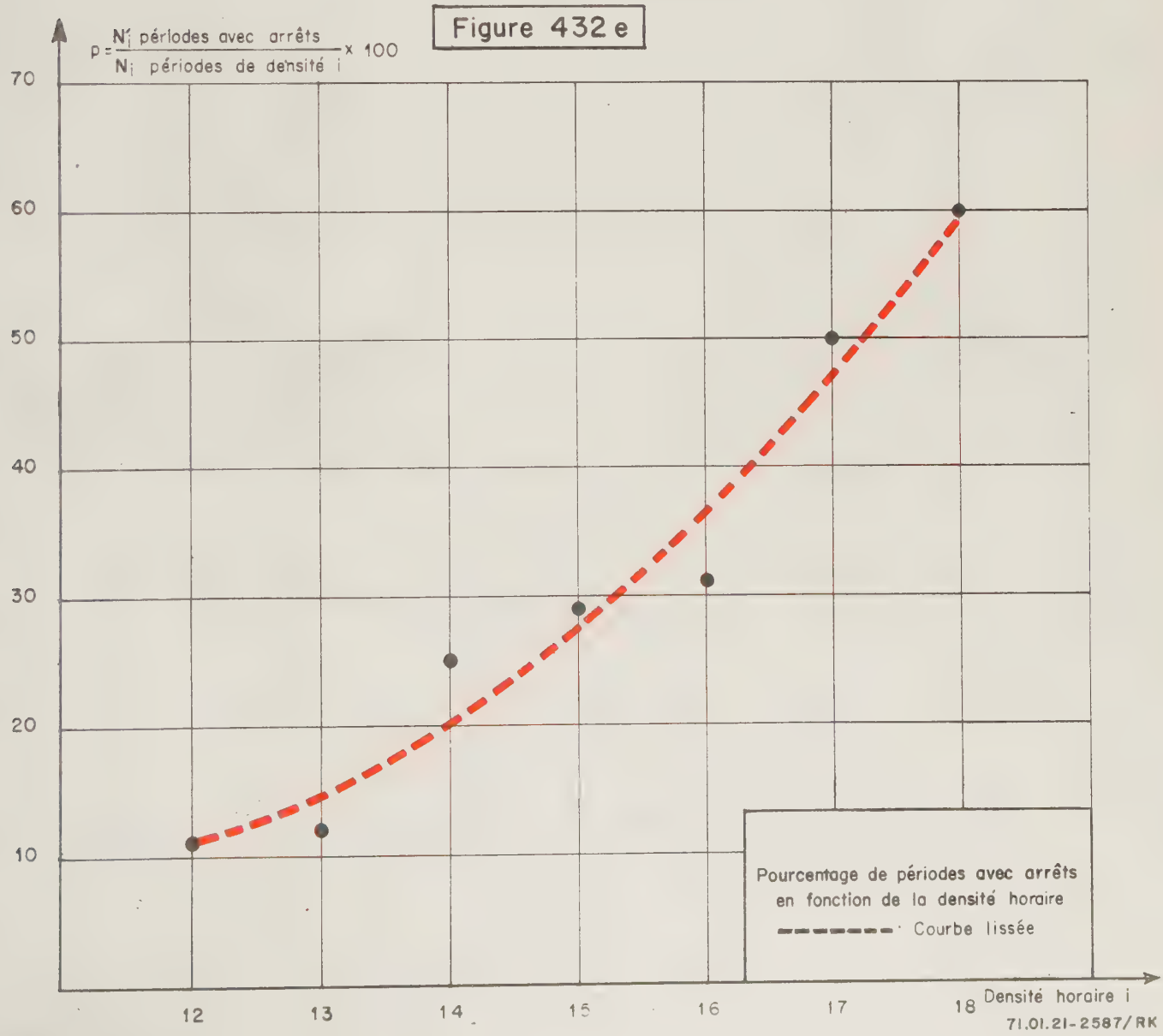
71.01.21-2588 / RK

Figure 432 c 5




Evolution du nombre de mouvements à GAGNY en fonction du jour de la semaine

Figure 432 e



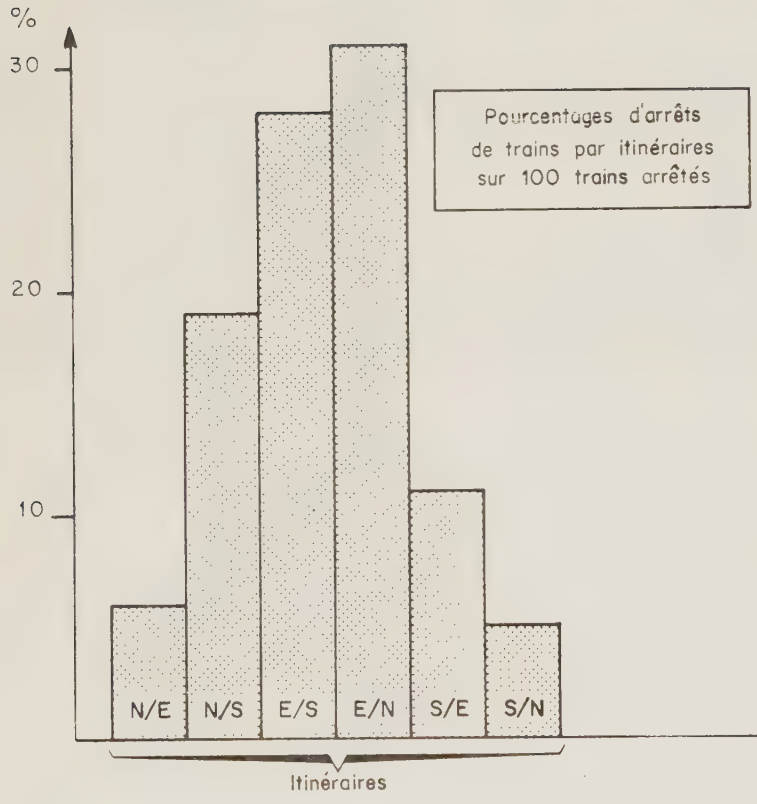



Figure 432 d 1

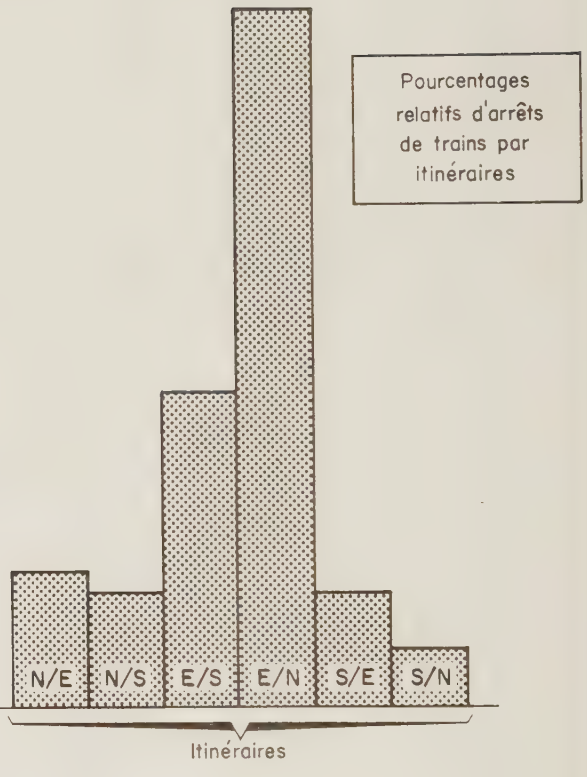
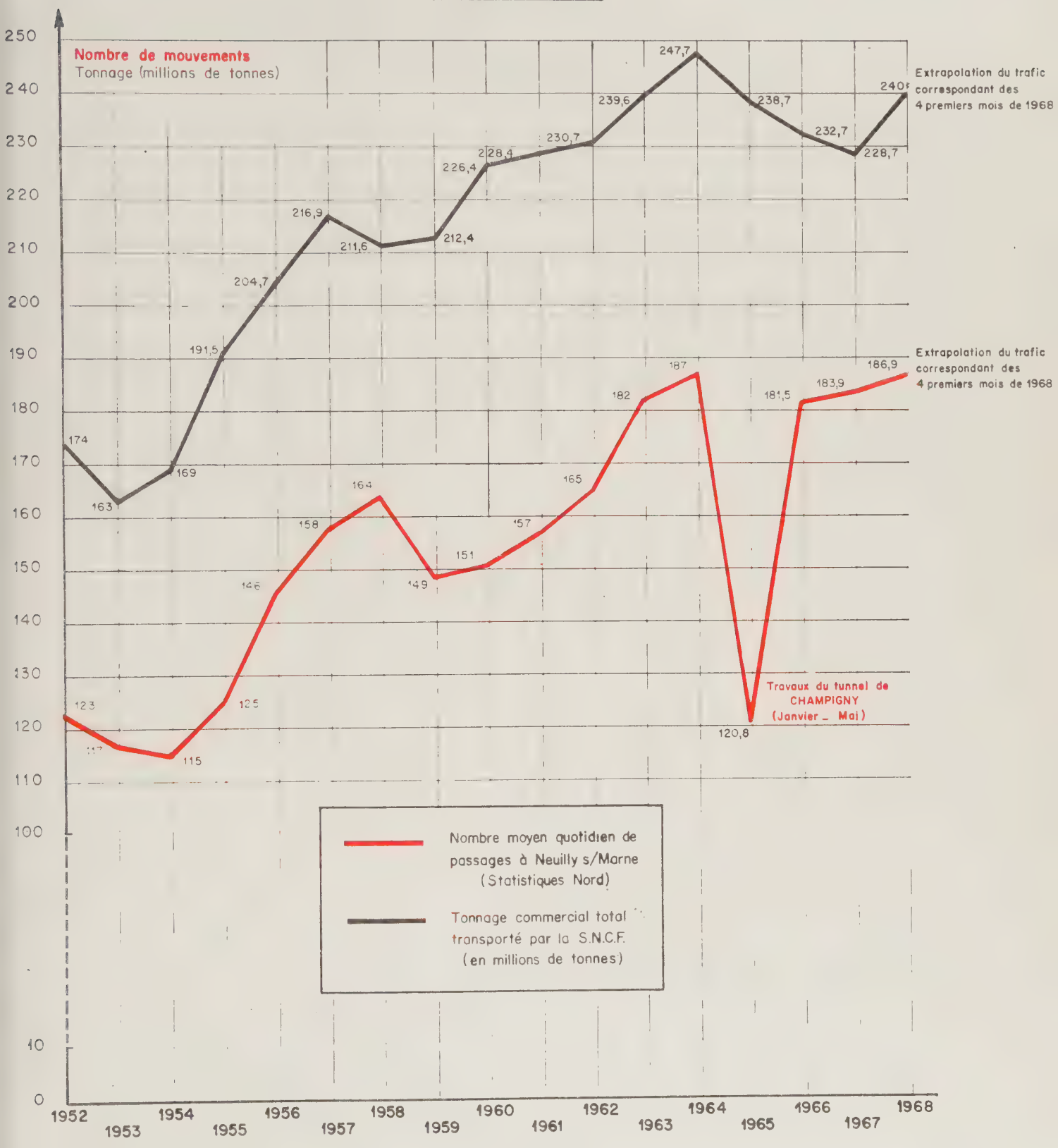



Figure 432 d 2

# ÉVOLUTION DU NOMBRE DE MOUVEMENTS SUR LE TRONÇON GAGNY — SUCY B. ET DU TONNAGE COMMERCIAL TOTAL DE LA S.N.C.F.

Figure 432 f




71.01.21-2590/RK

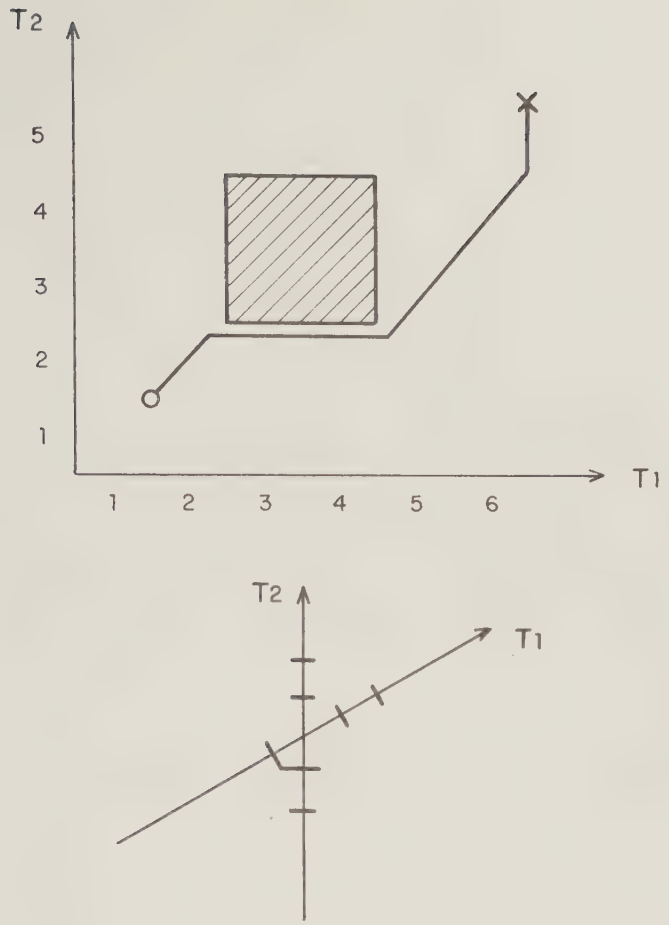



Figure 433 a

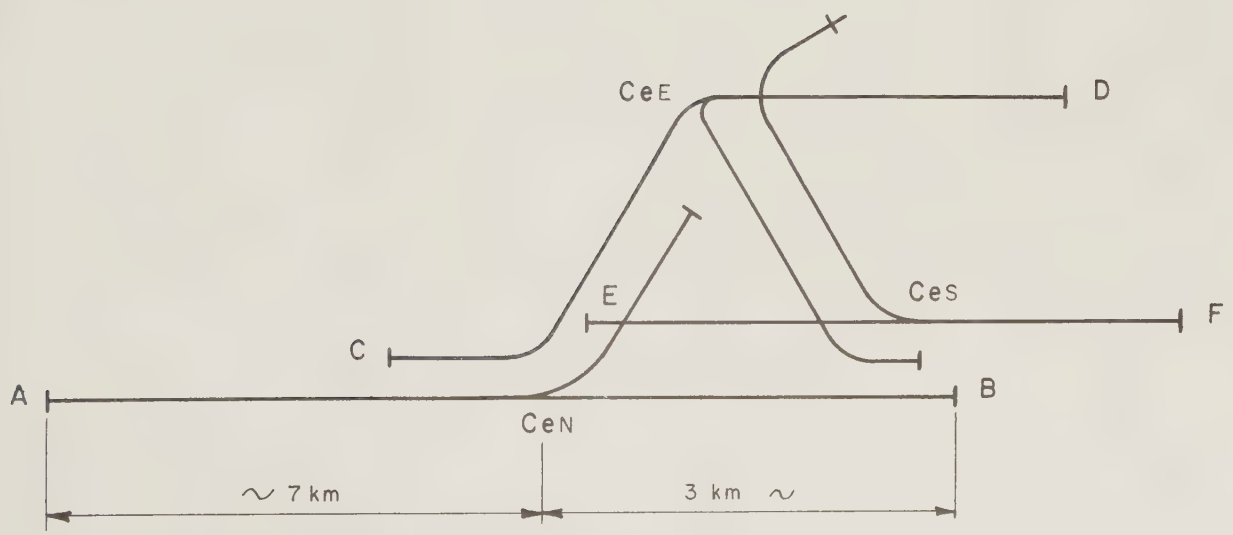



Figure 434 a

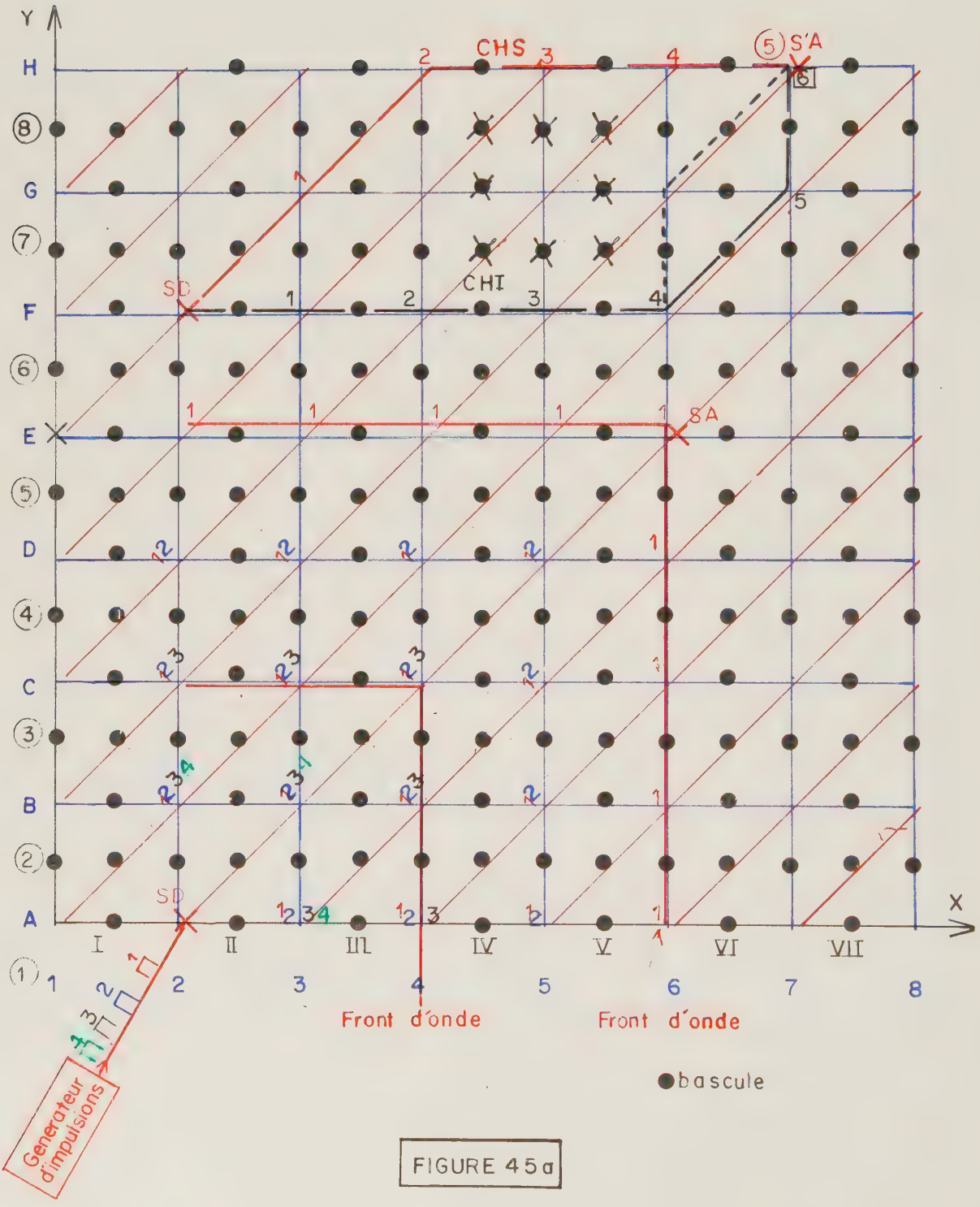

Y
X
H
G
F
E
D
C
B
A
CHS
CHI
S'A
SA
SD
SD
Front d'onde
Front d'onde
Generateur d'impulsions
bascule

FIGURE 45a

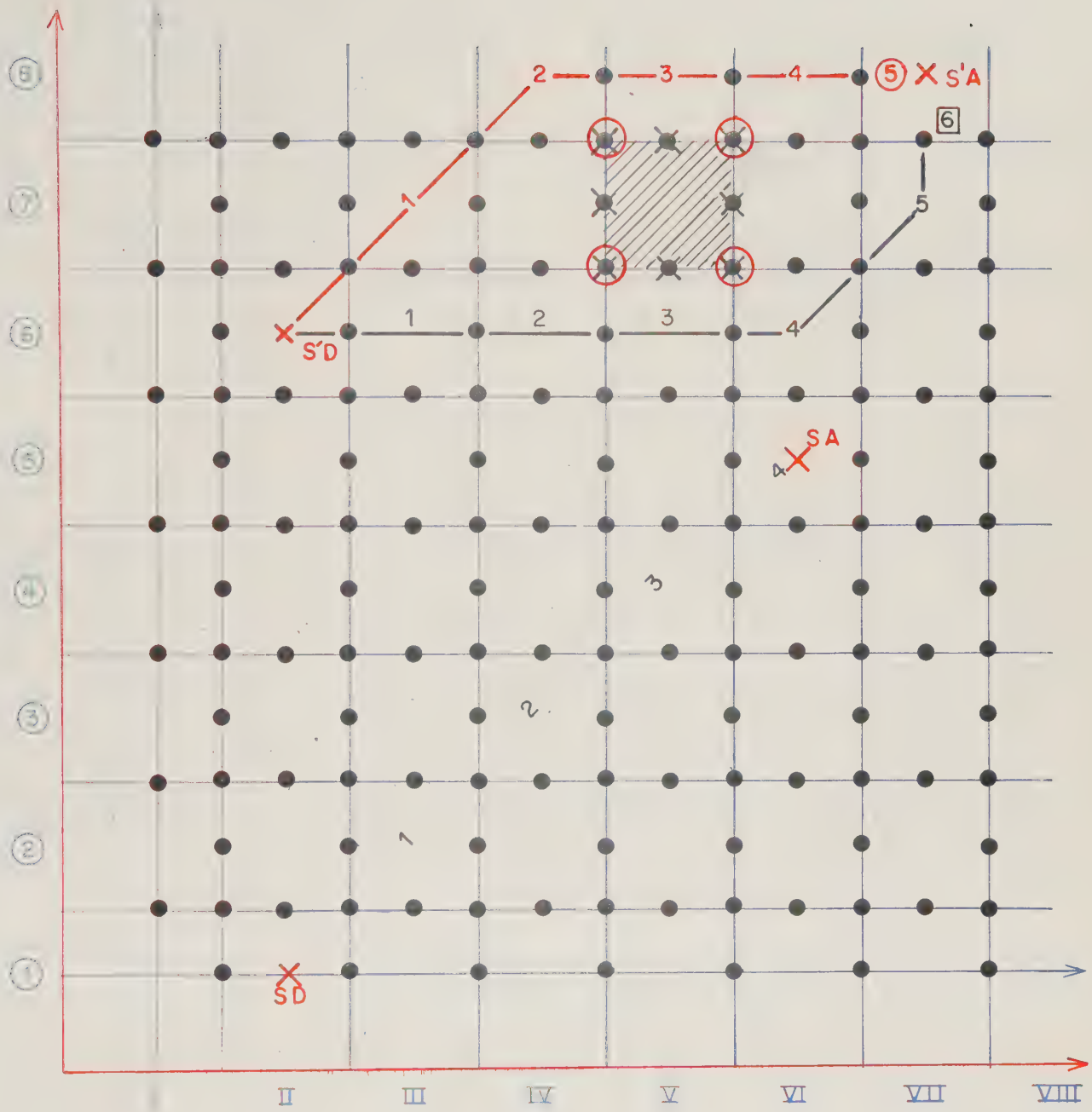



FIGURE 45 b

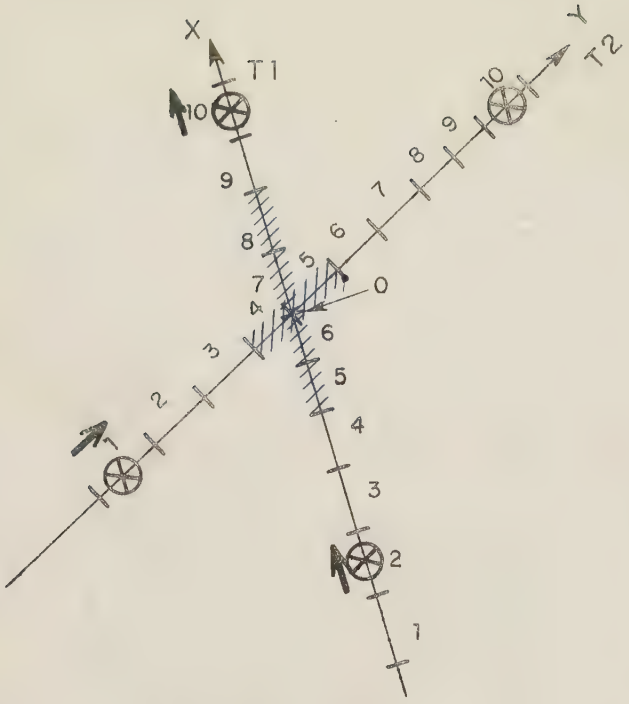



Figure 45 c

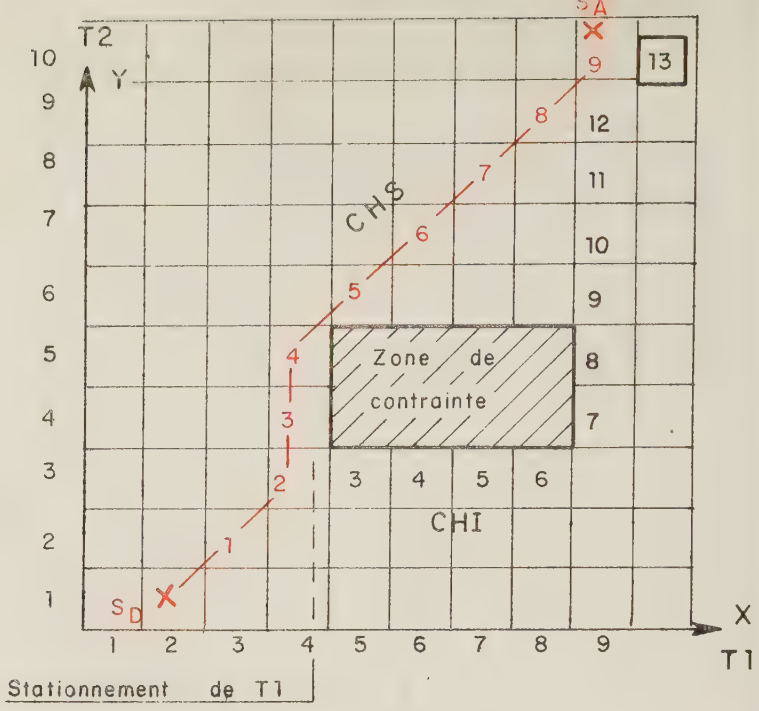



Figure 45 d

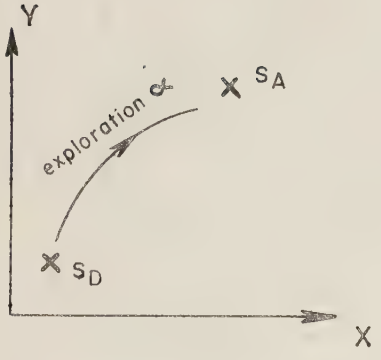



Figure 45 e

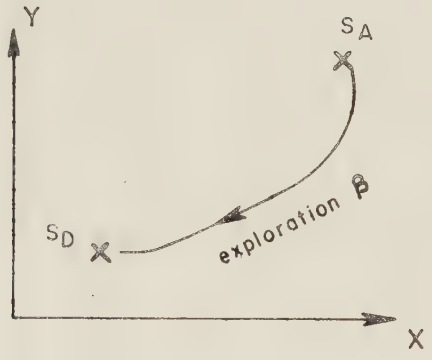



Figure 45 f

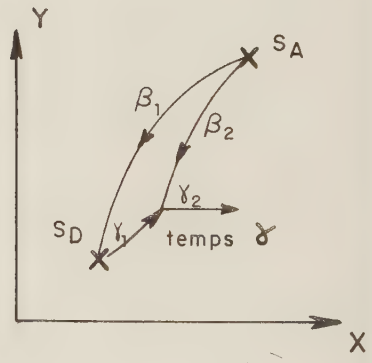



Figure 45 g

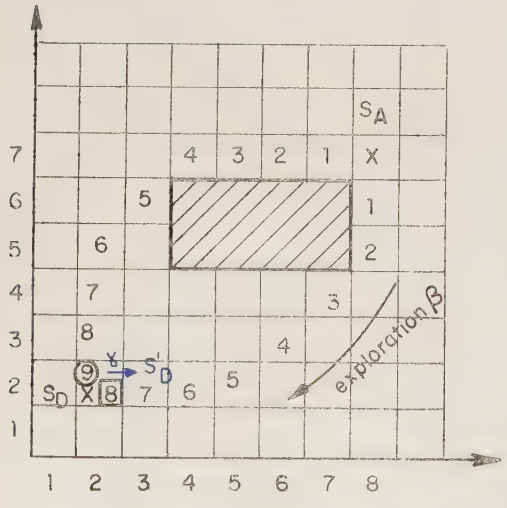



Figure 45 h

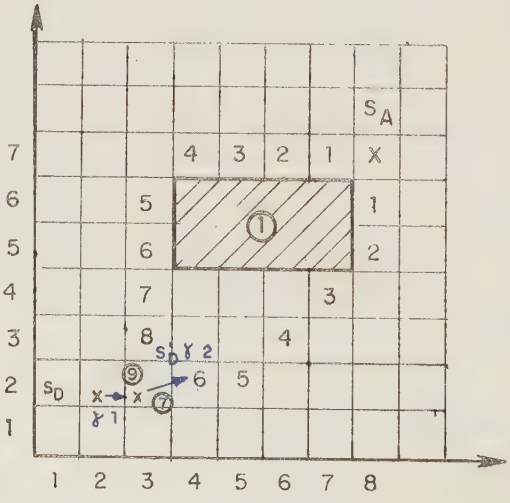



Figure 45 i

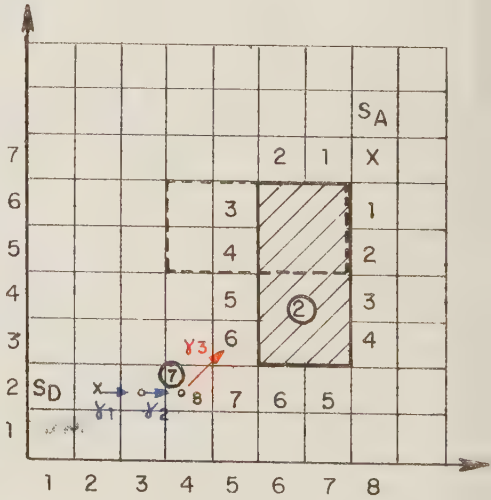



Figure 45 j

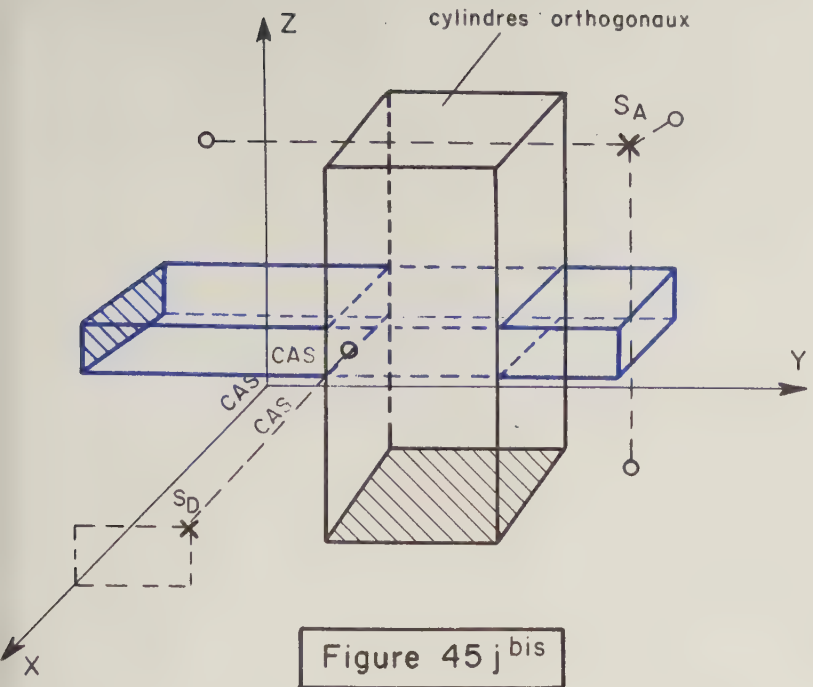



Figure 45 j bis

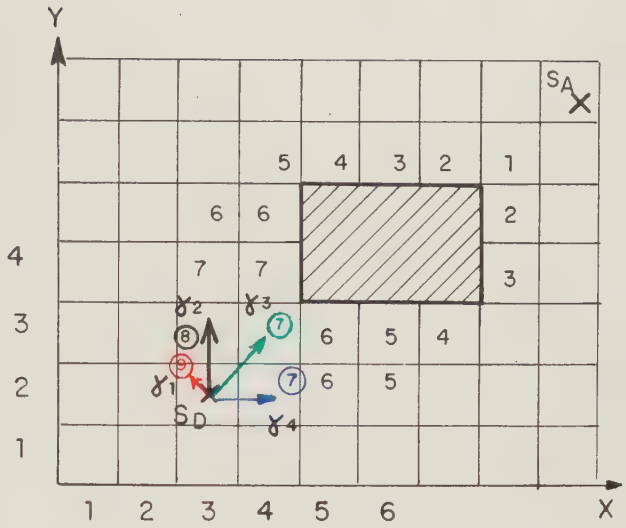



Figure 45 k

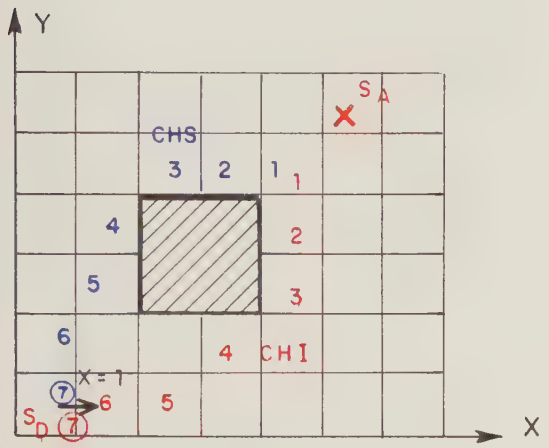



Figure 45 m

( hiérarchie intervariables )

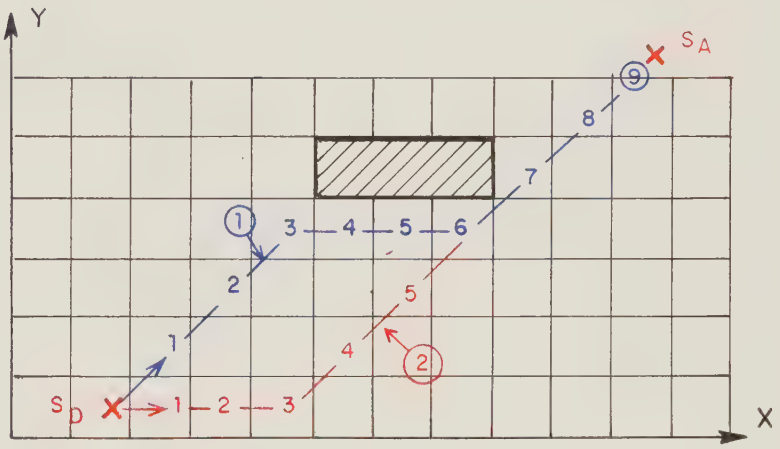



Figure 45 l

( hiérarchie interactions )

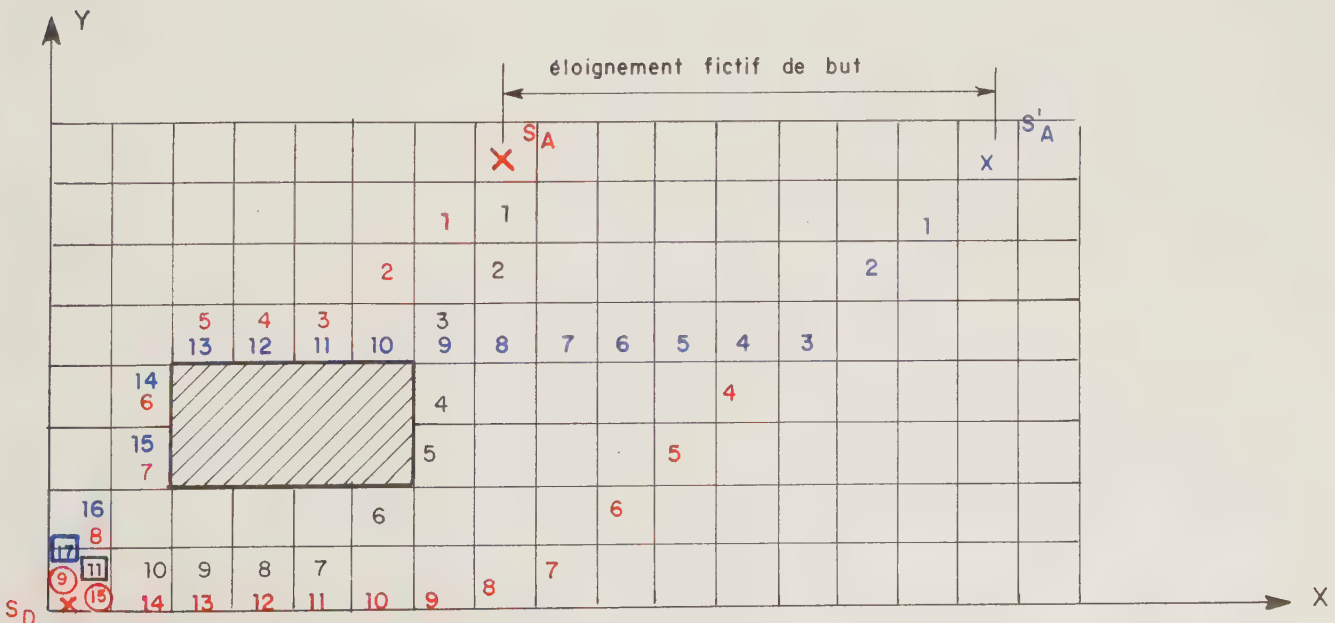



Figure 45 n ( priorité )

71.03.25-2785/RK

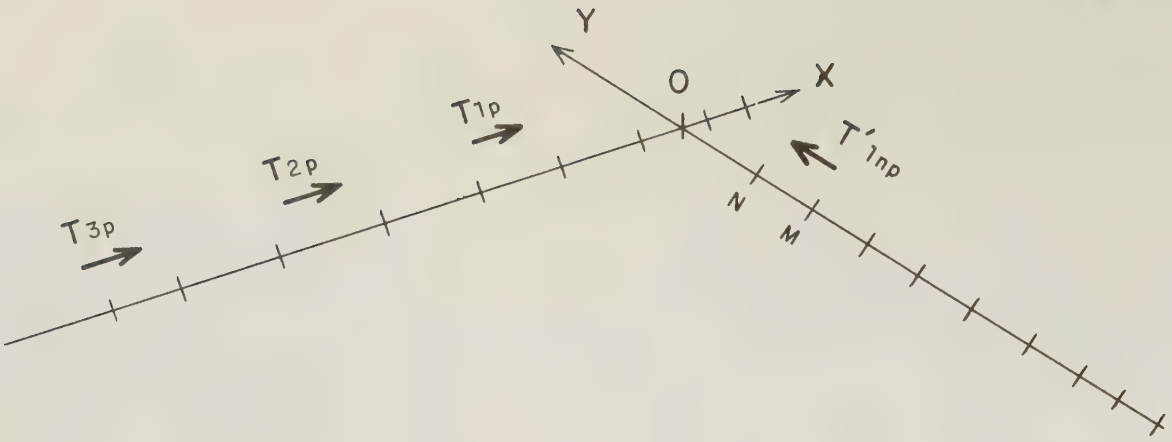



Figure 45 o

(fonctionnement dynamique )

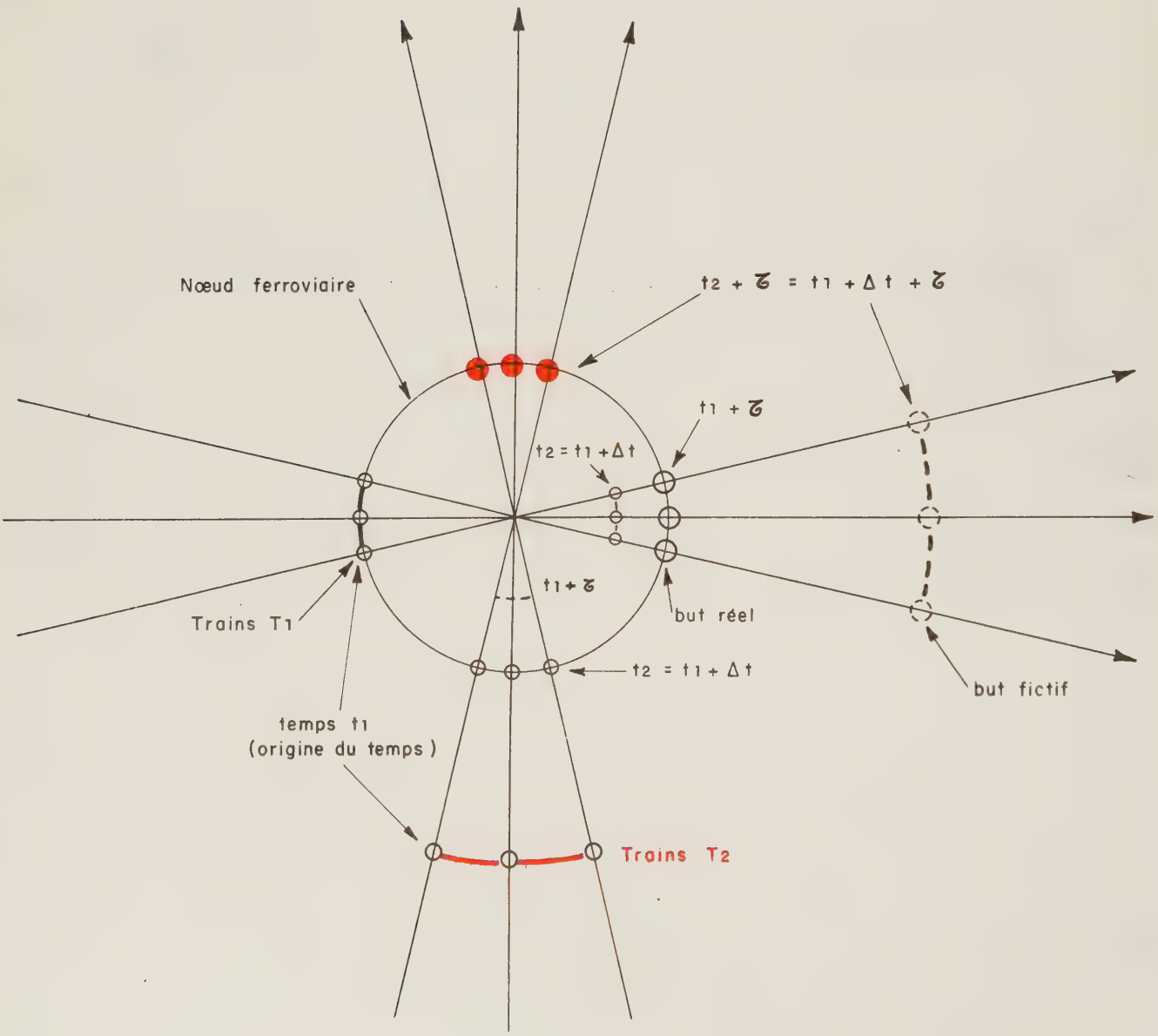



Figure 45 p

( fonctionnement dynamique )

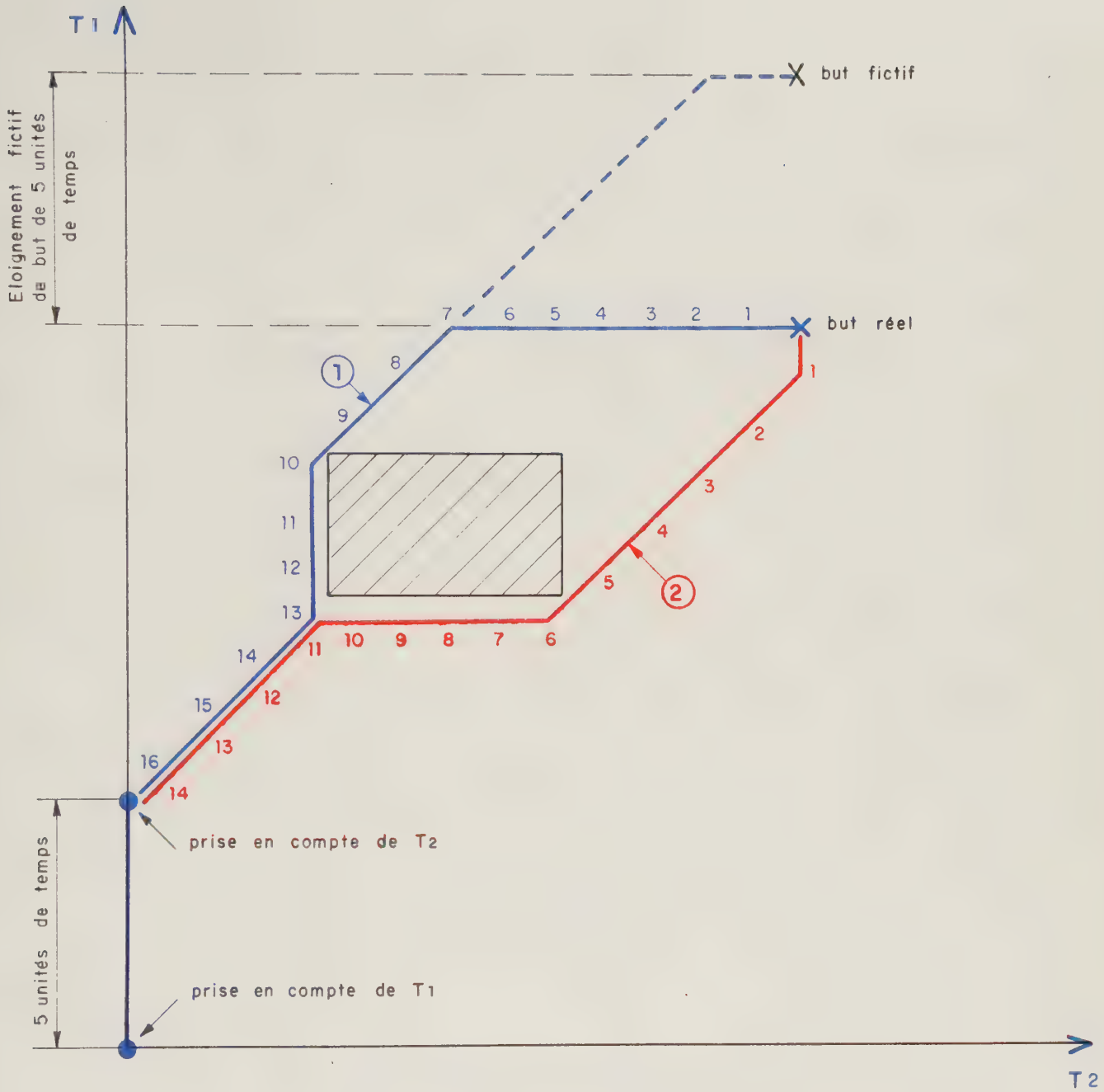



Figure 45q

( fonctionnement dynamique )

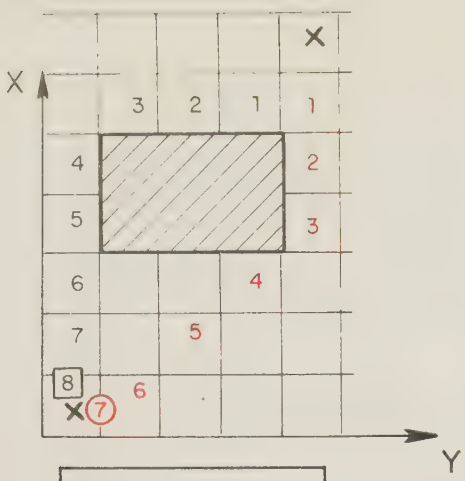



Figure 45r1

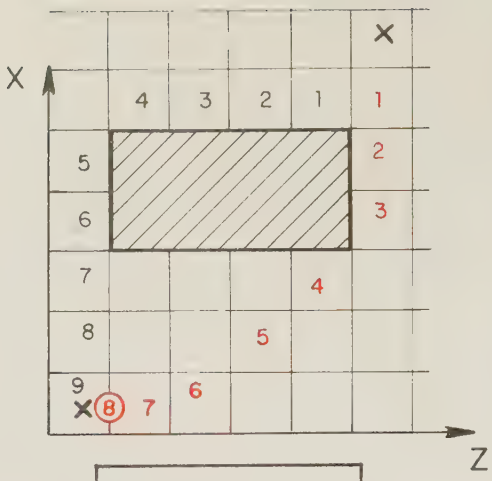



Figure 45r2

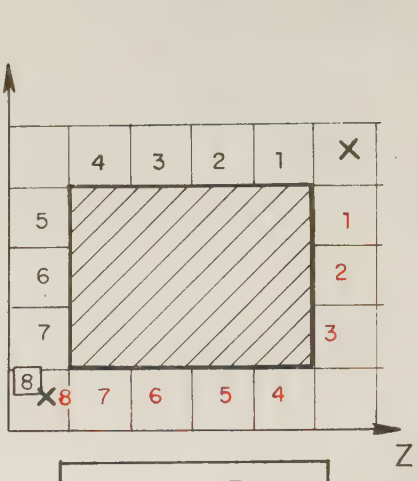



Figure 45r3

Si ≡ S'i

Figure 4544 a

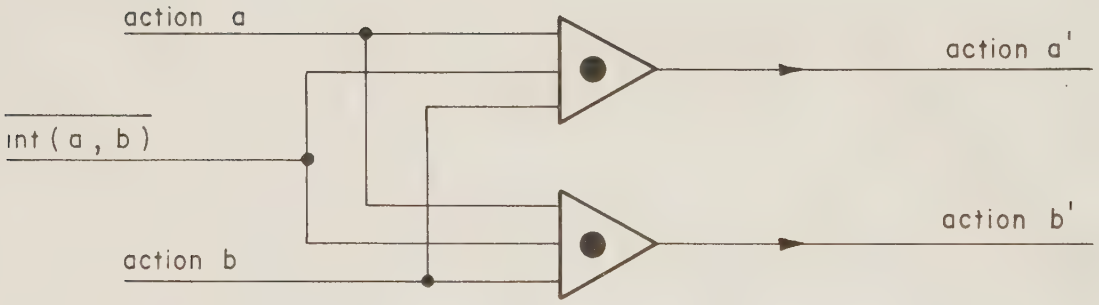
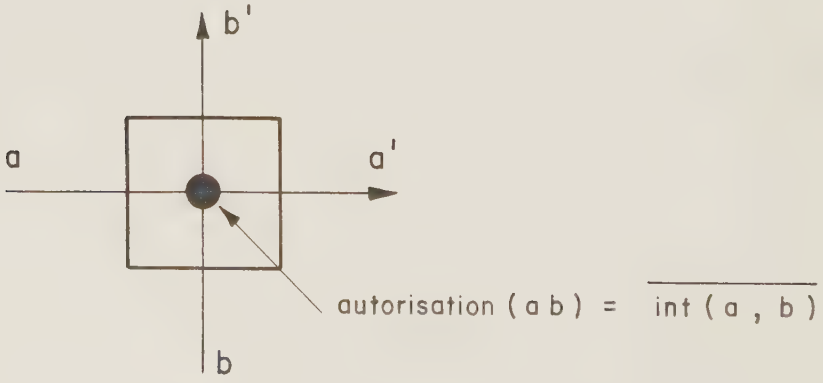



Figure 4544 b




Représentation d'une comparaison élémentaire de deux actions.

Figure 4544 c

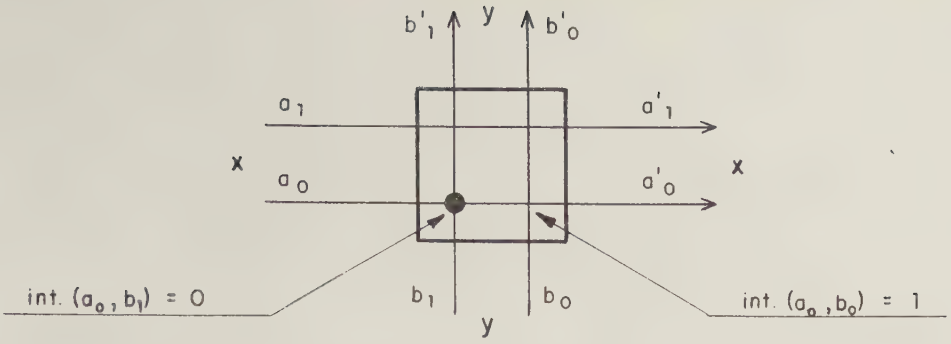



Figure 4544d

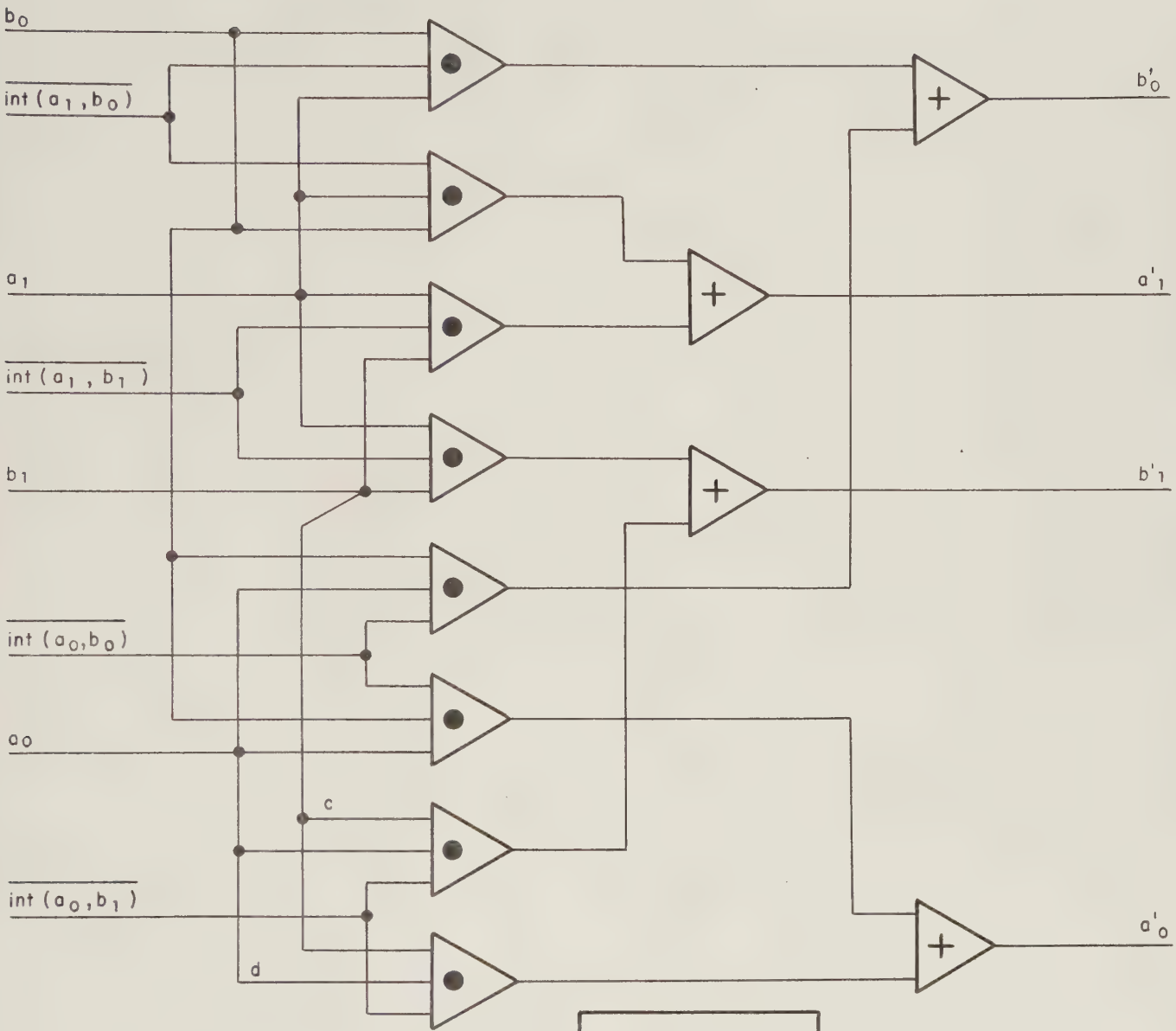



Figure 4544e

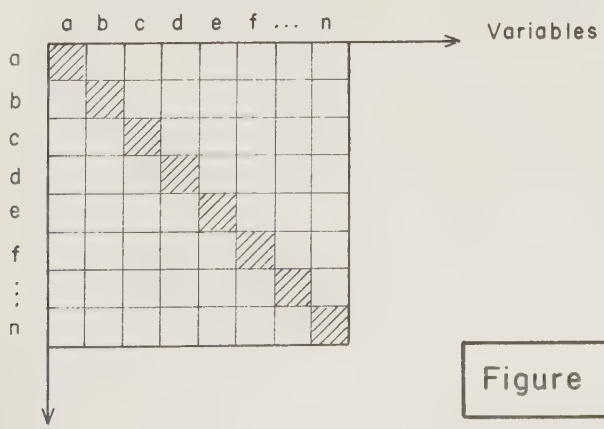



Figure 4544f

71.03.24-2760/RK

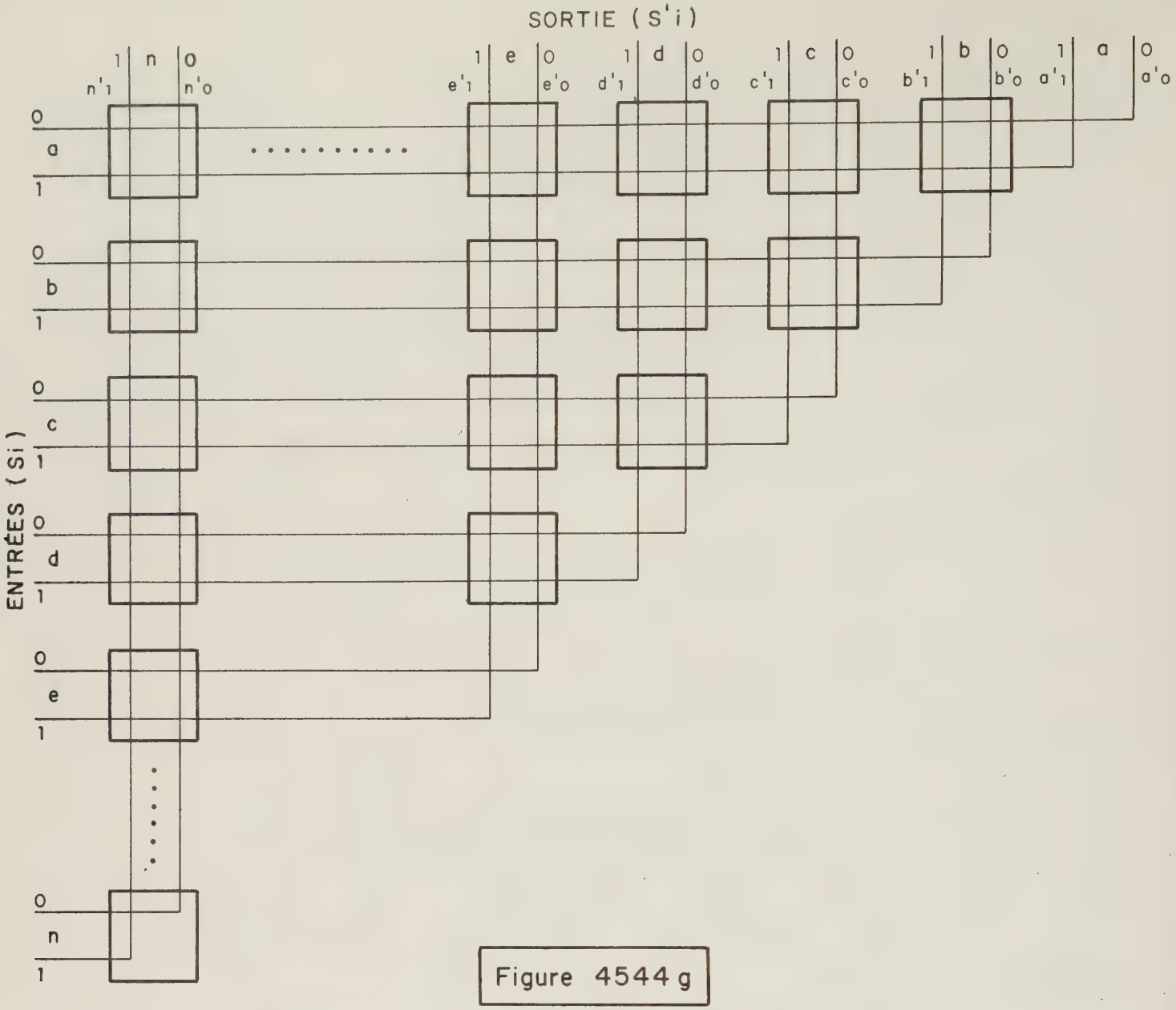
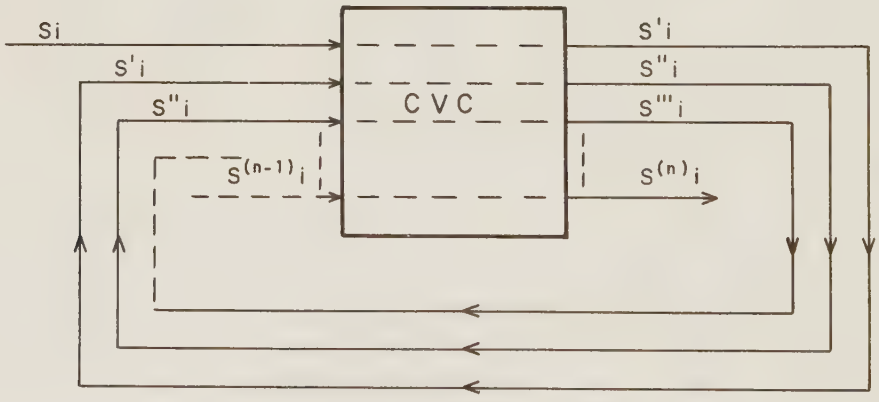



Figure 4544 g




Exemple de vérification de cohérence au $n^{ième}$ niveau.

Figure 4545 a

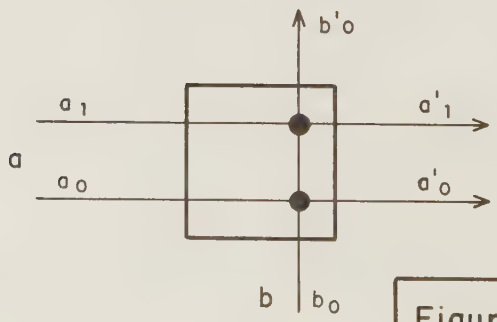



Figure 4545 b

71.03.24-2761/RK

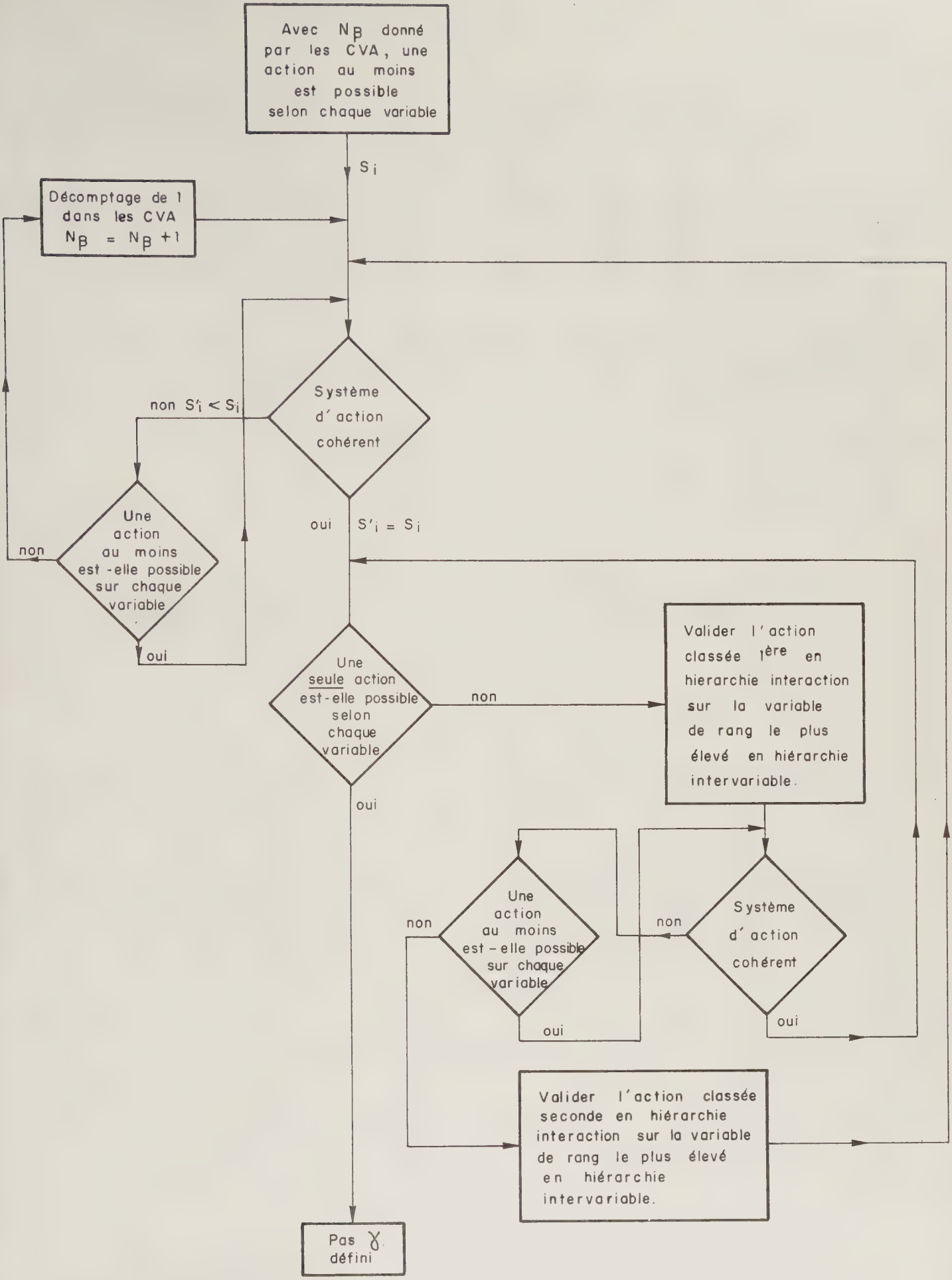



**Figure 4545c**

Algorigramme C.V.C.

71.03.24-2762/RK

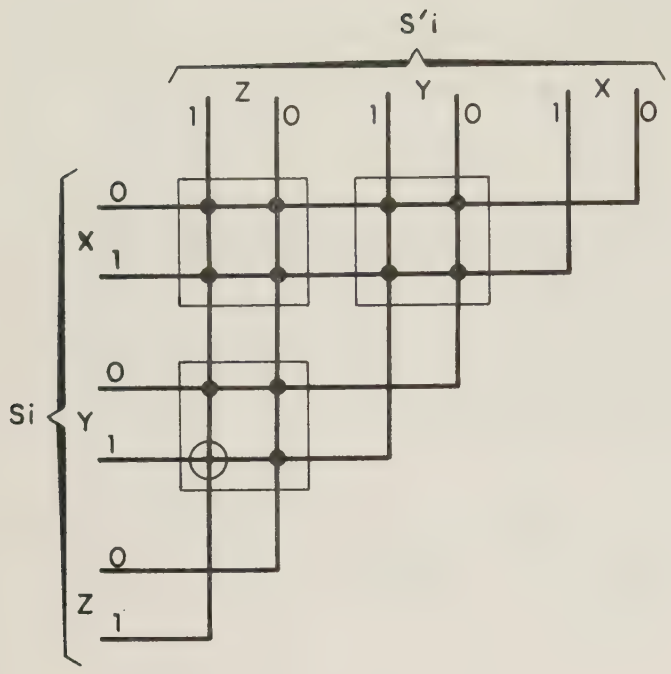



Figure 4545 d

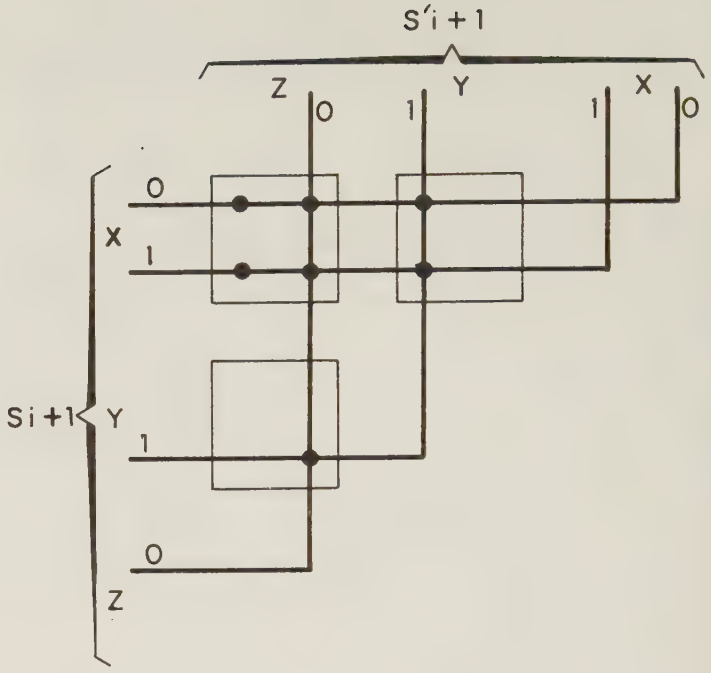



Figure 4545 e

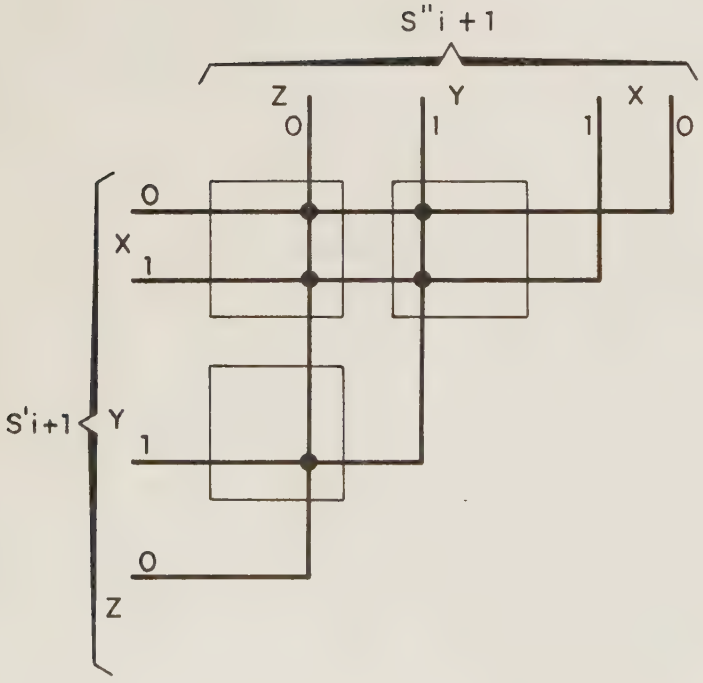



Figure 4545 f

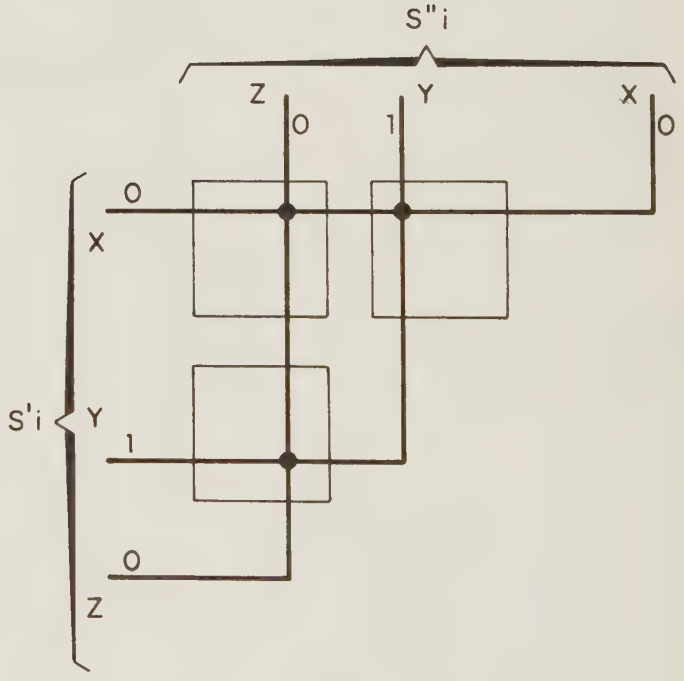
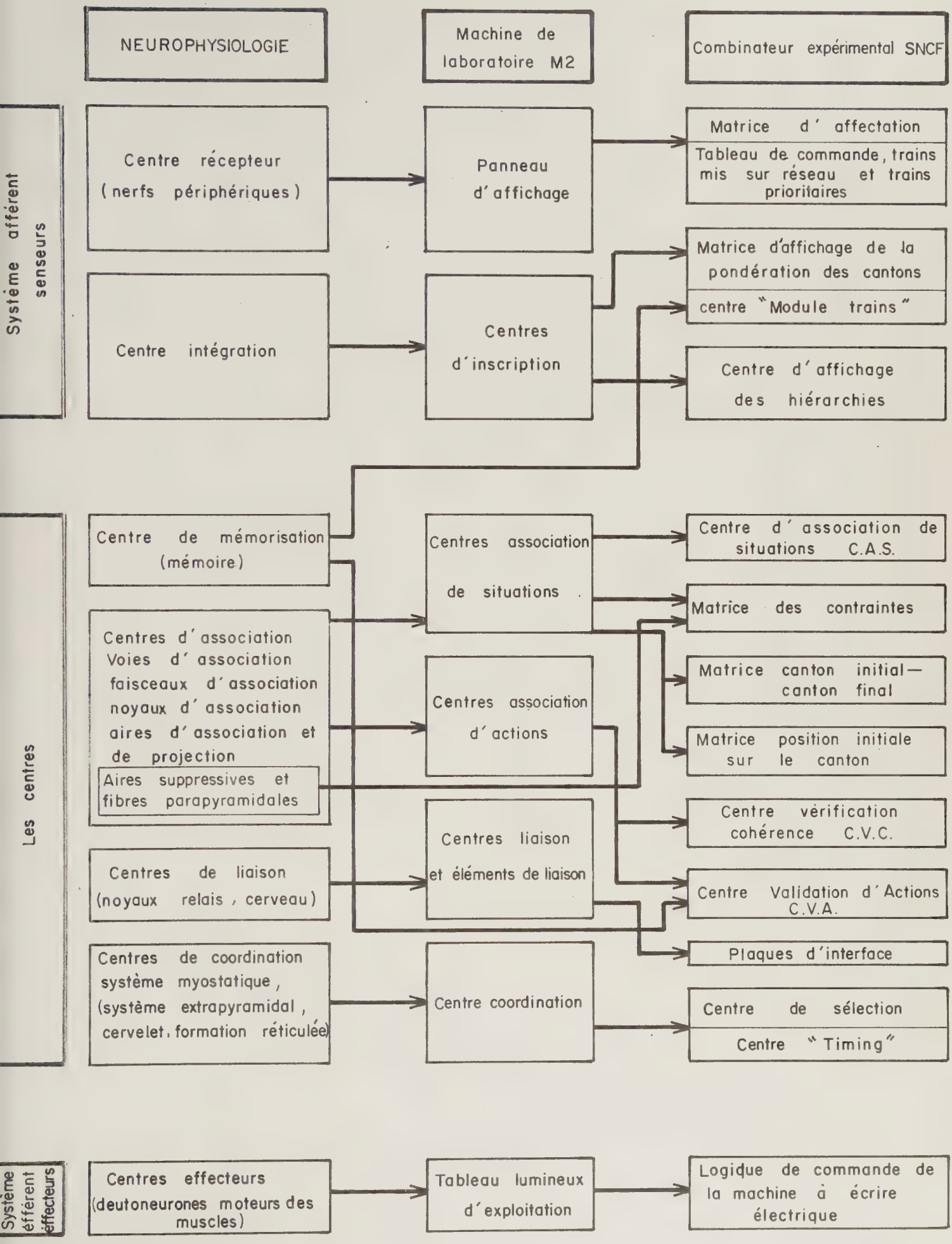



Figure 4545 g

# ANALOGIE ENTRE LES CENTRES NEUROPHYSIOLOGIQUES ET LES "MÉMOIRES ACTIVES"

Figure 46 a




71.04.07-2828/RK

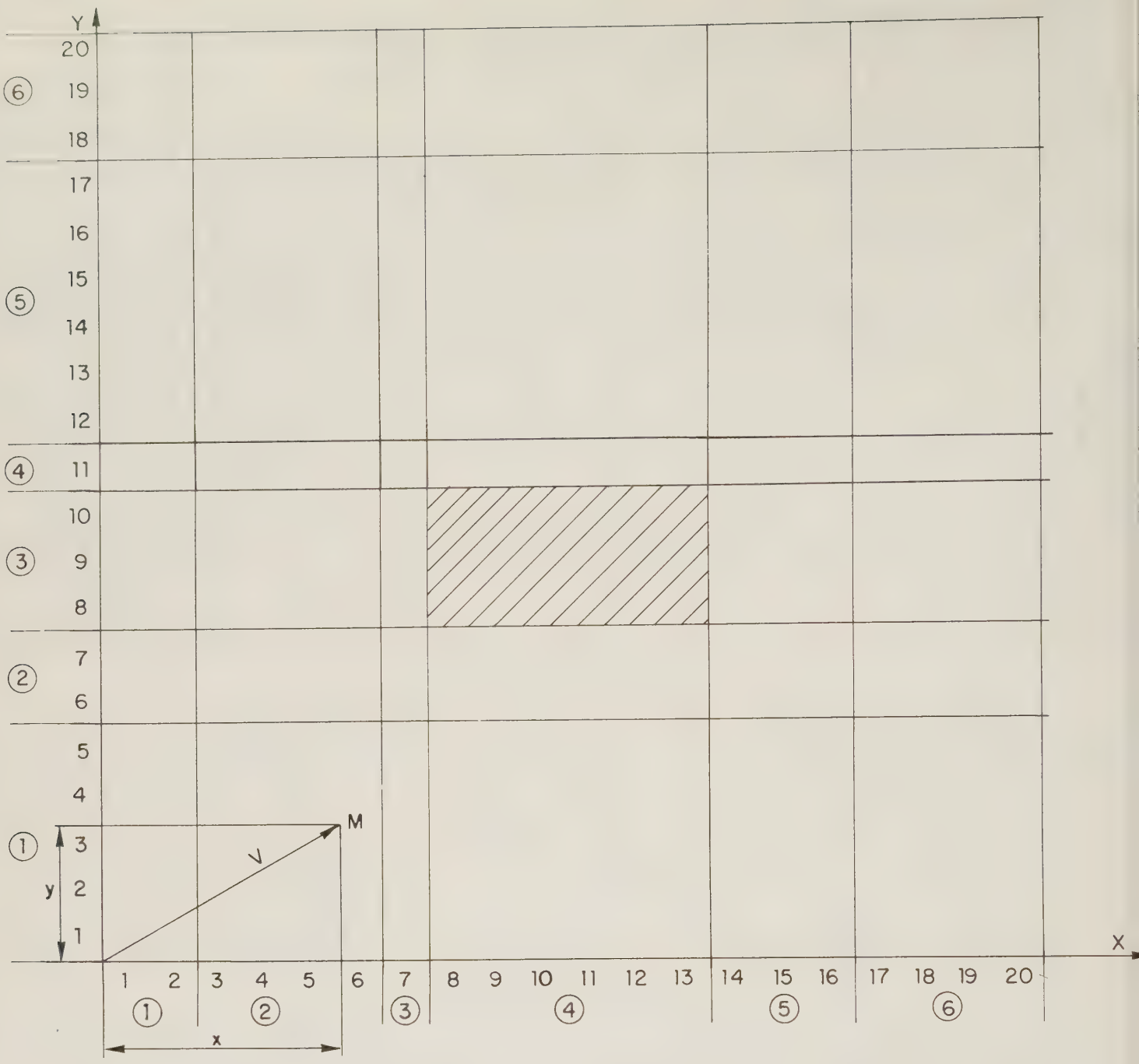



Figure 47111a

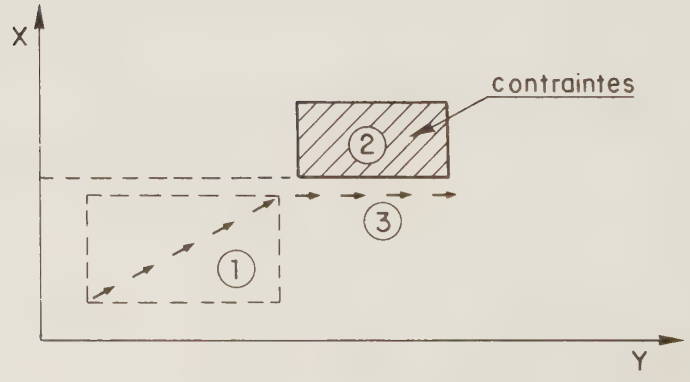
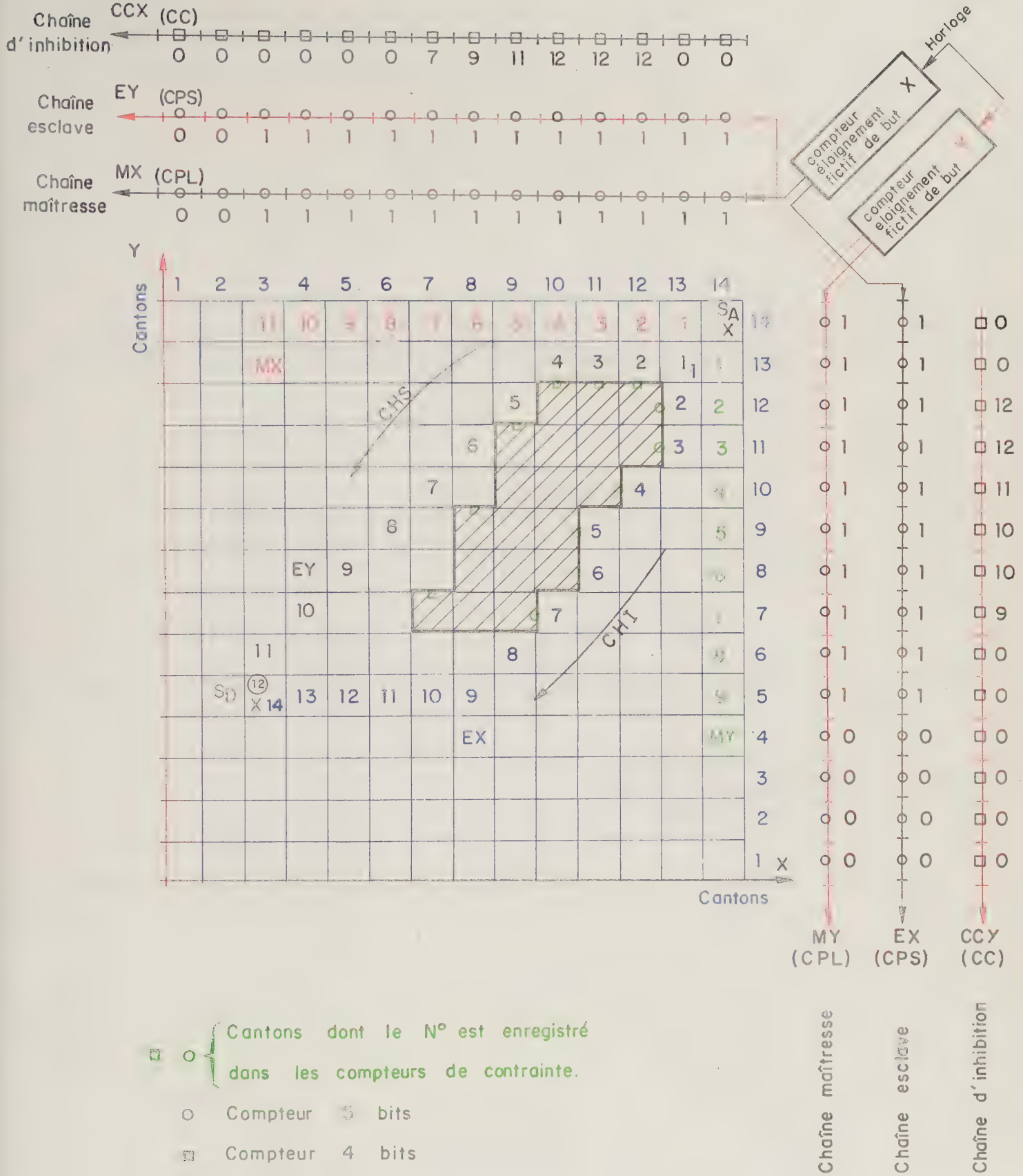



Figure 47111b




□ ○ { Cantons dont le N° est enregistré dans les compteurs de contrainte.

○ Compteur 5 bits

□ Compteur 4 bits

Figure 47111c

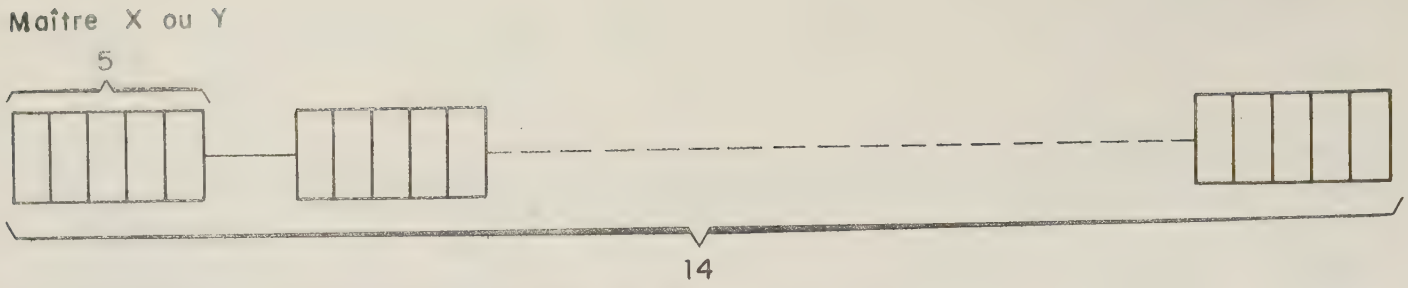



Figure 47111 d

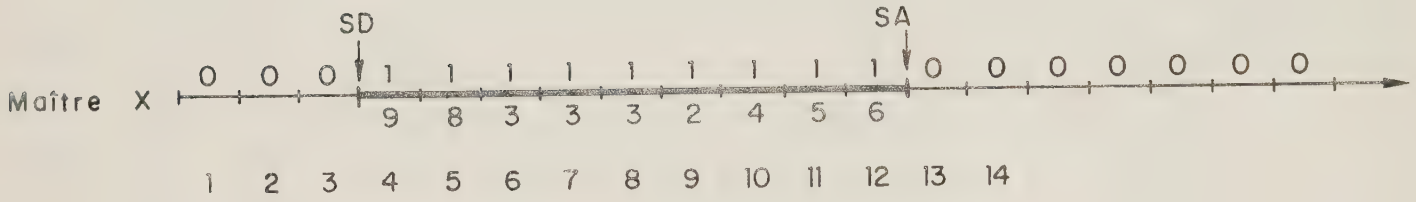



Figure 47111 e

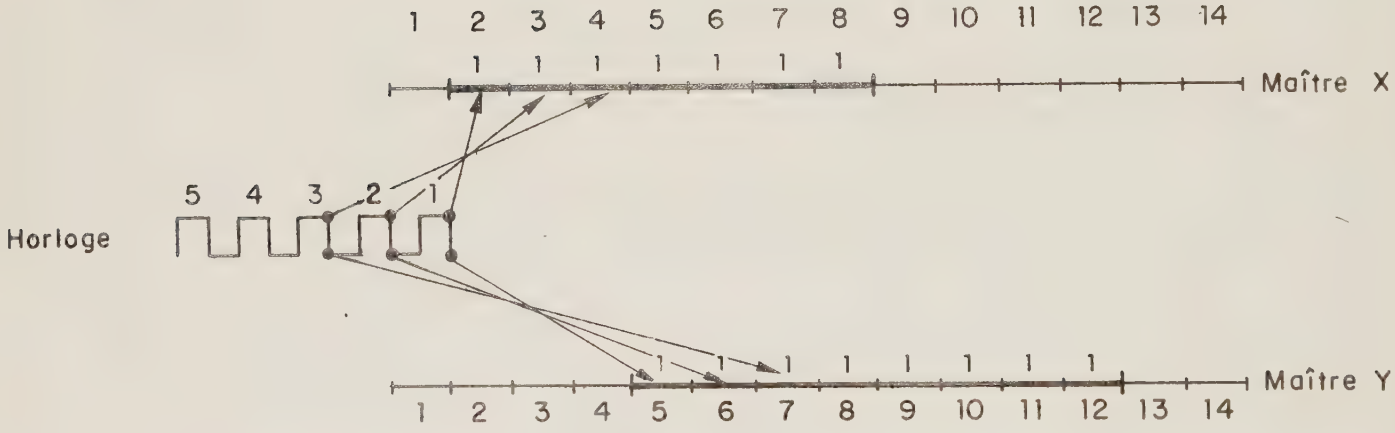



Figure 47111 f

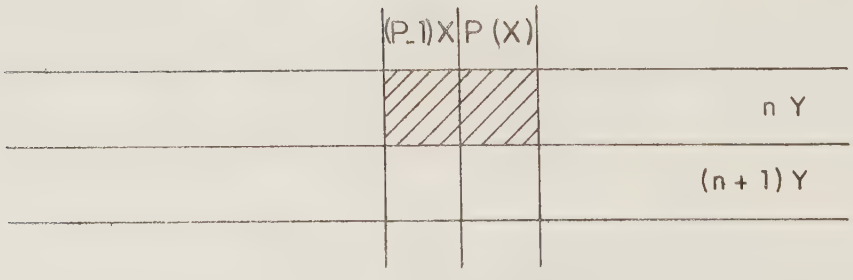



Figure 47111g

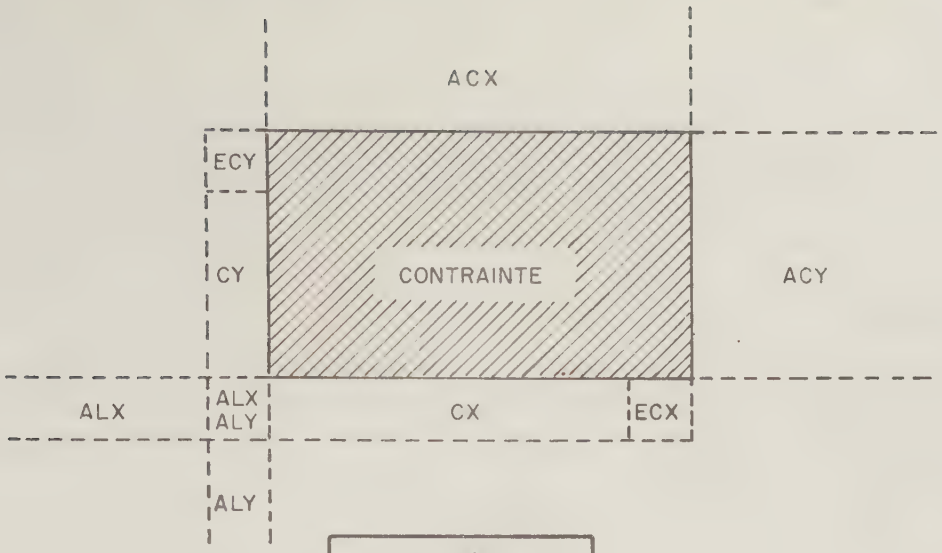



Fig. 47111 h

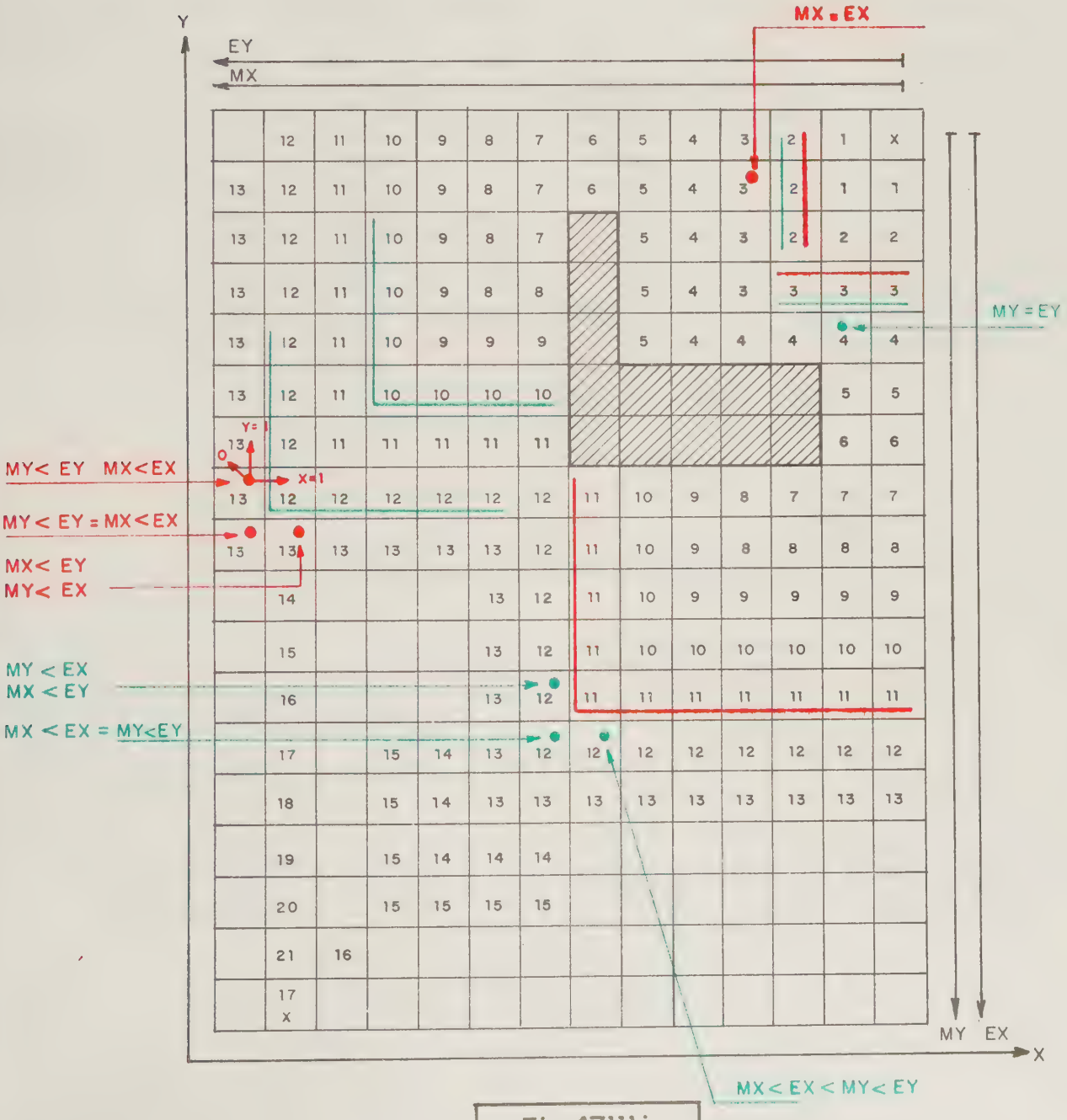
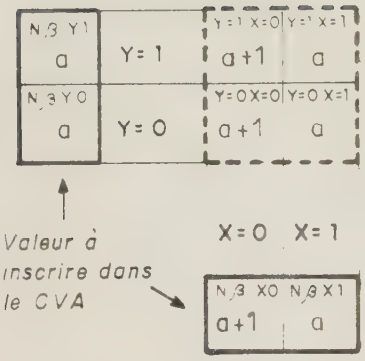



Fig. 47111 j

# 4.71132 ETUDE DES CAS POSSIBLES

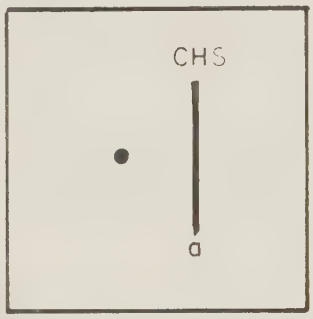
## CAS N° 1



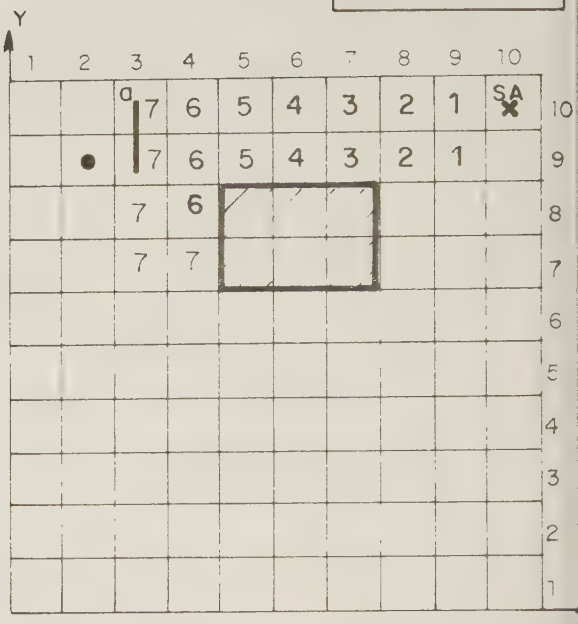

*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

*Valeur à inscrire dans le CVA*

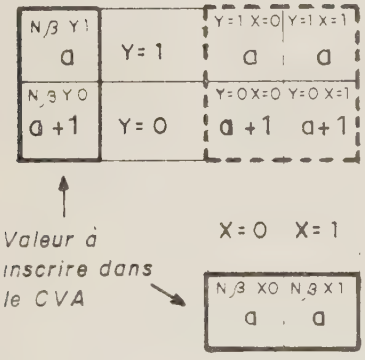



EY< EX
EY< MX



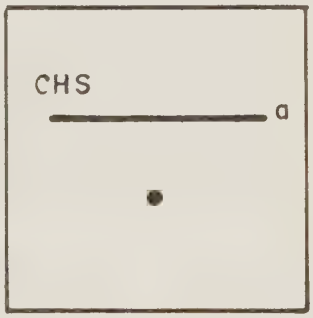

## CAS N° 2



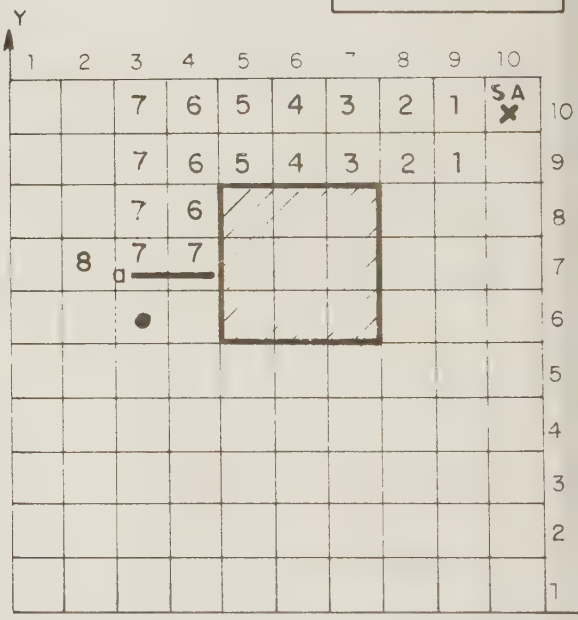

*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

*Valeur à inscrire dans le CVA*

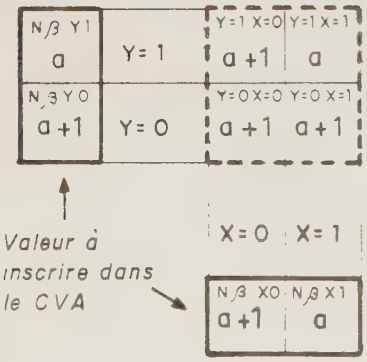



EY>MX
EY<EX



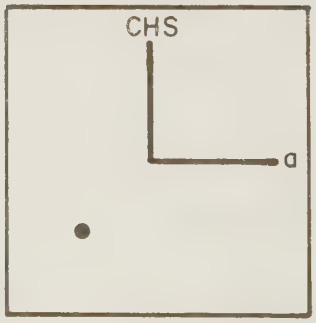

## CAS N° 3



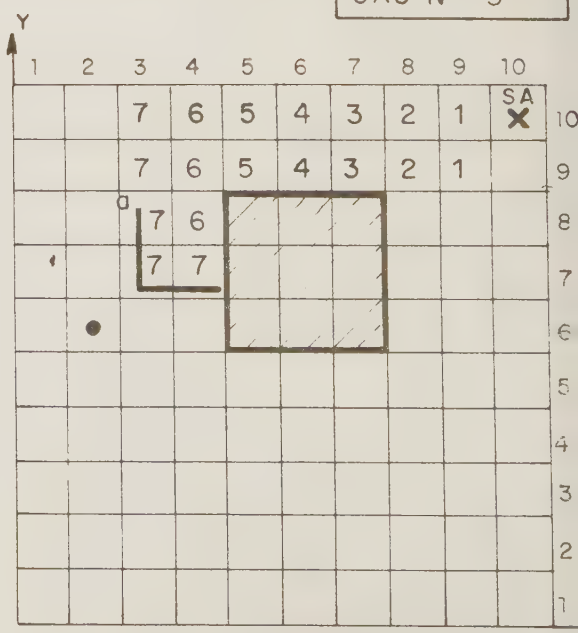

*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

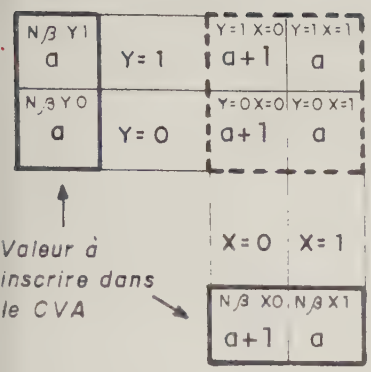
*Valeur à inscrire dans le CVA*



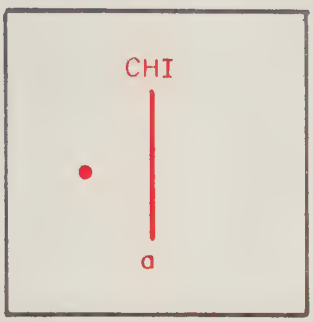

EY =MX
EY<EX





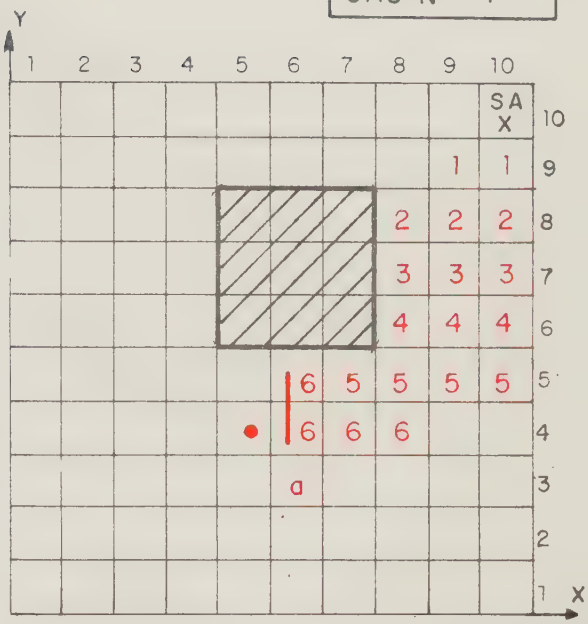

*Valeur à inscrire dans le CVA*

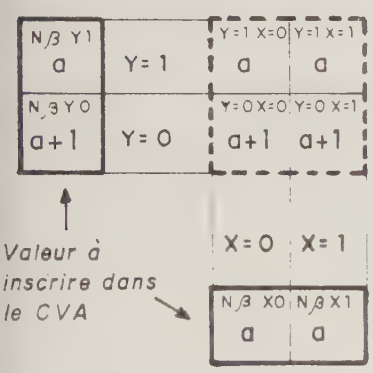
*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*




EX < EY
EX > MY

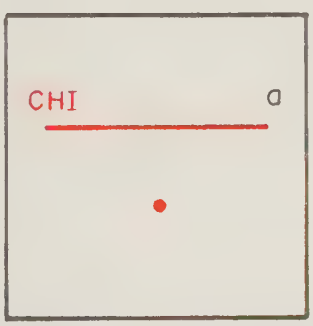
## CAS N° 4



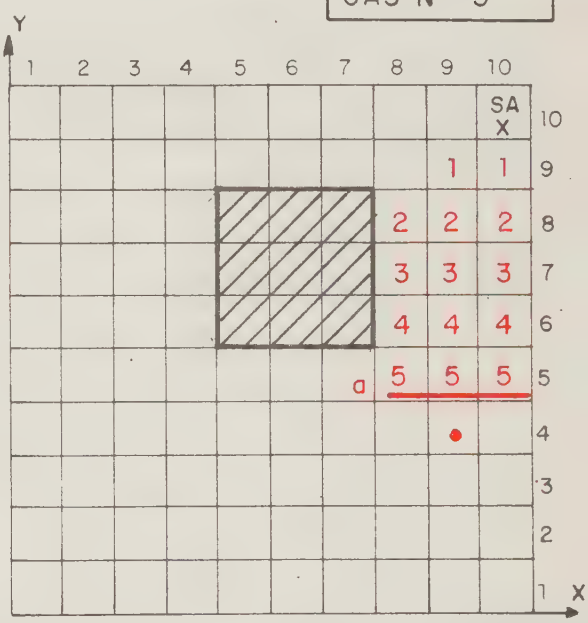

*Valeur à inscrire dans le CVA*

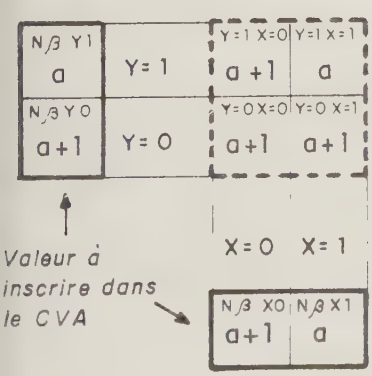
*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*




EX < MY
EX < EY

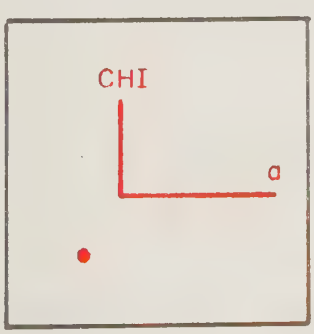
## CAS N° 5



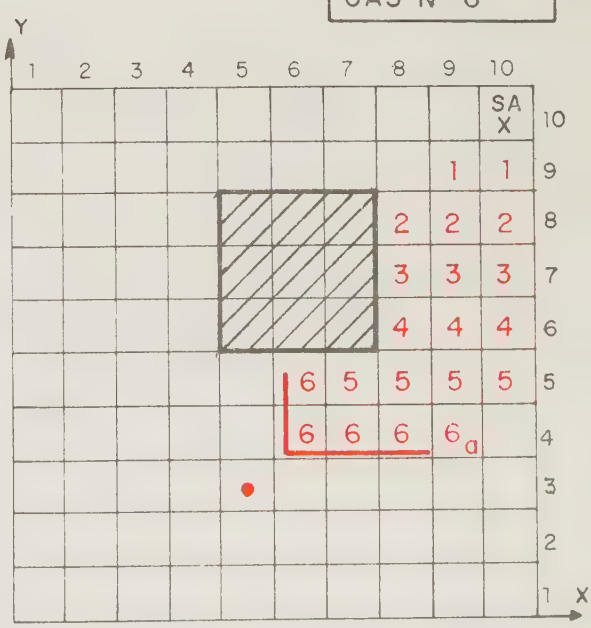

*Valeur à inscrire dans le CVA*

*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*




EX = MY
EX < EY

## CAS N° 6



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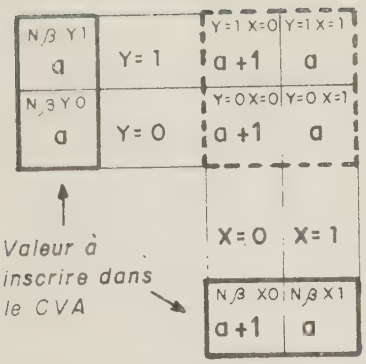
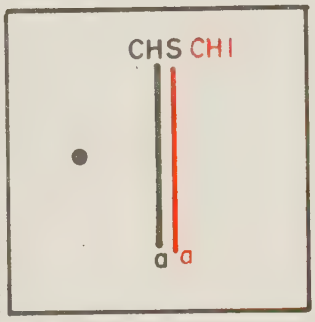
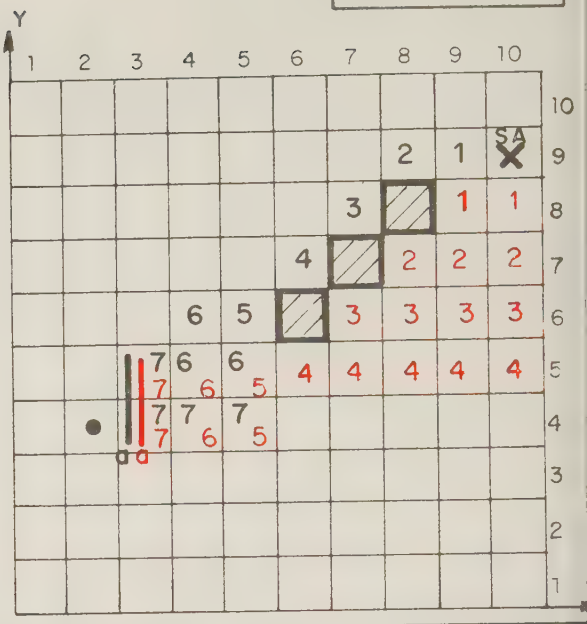



*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

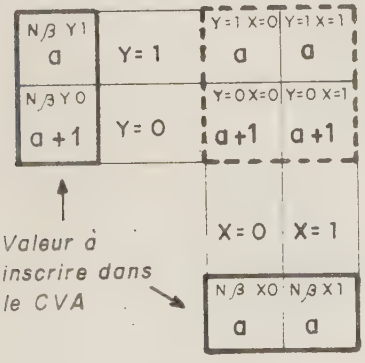
*Valeur à inscrire dans le CVA*




EY<MX
EX>MY
EX=MX

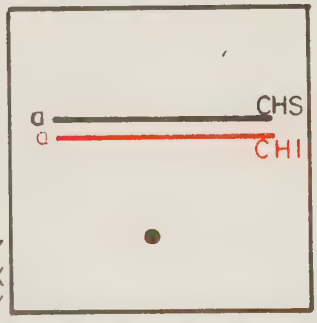



## CAS N° 8

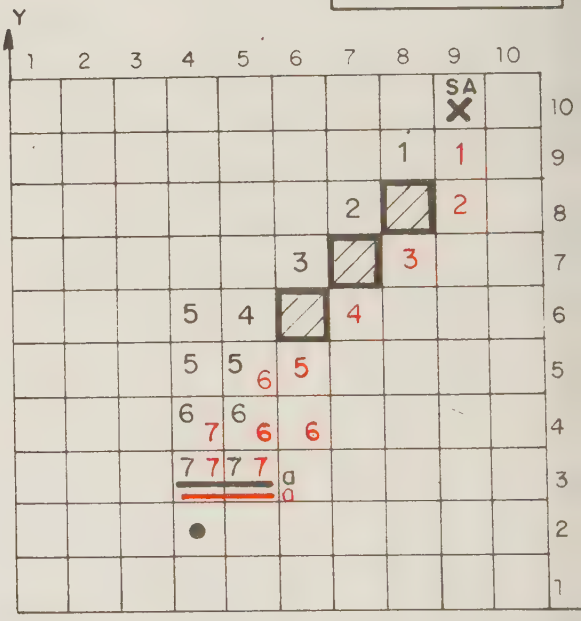



*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

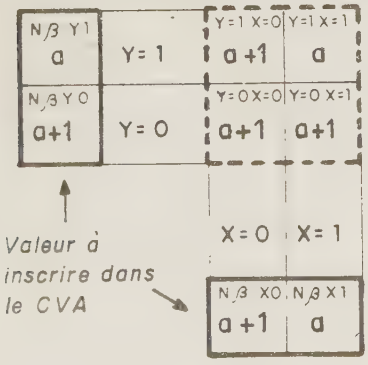
*Valeur à inscrire dans le CVA*




EY = MY
EY >MX
EX<MY

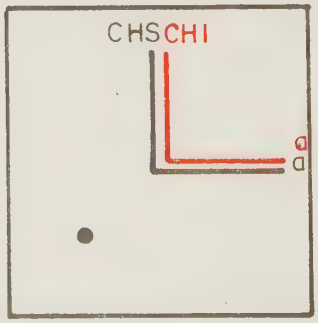



## CAS N° 9

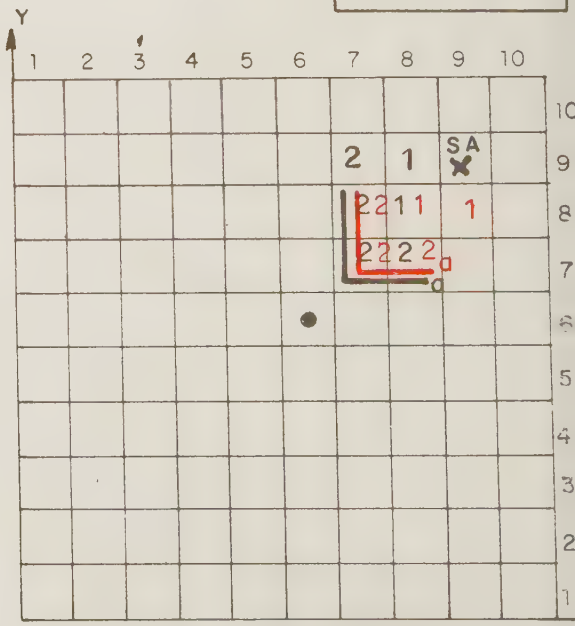


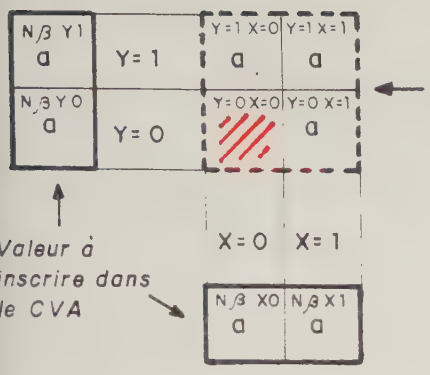

*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

*Valeur à inscrire dans le CVA*



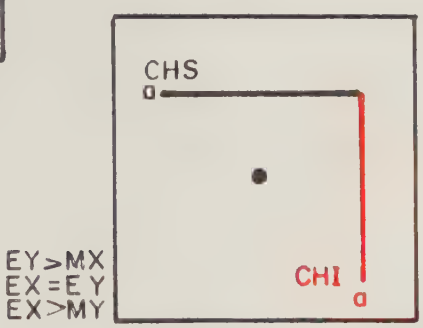

EX=EY=MX=MY



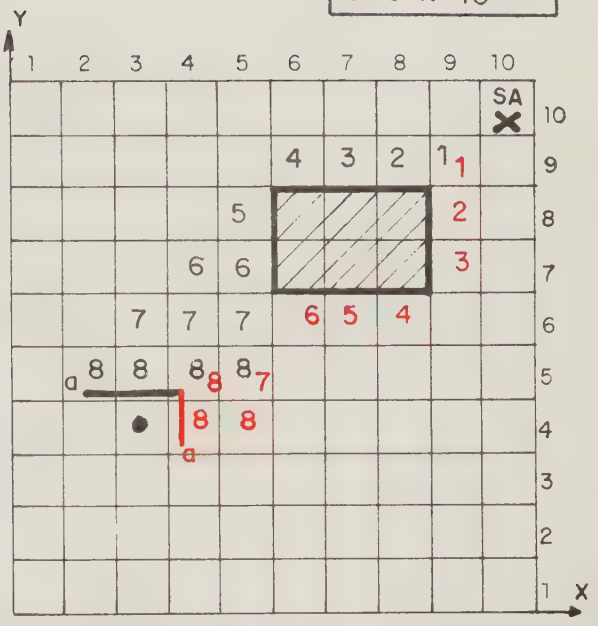


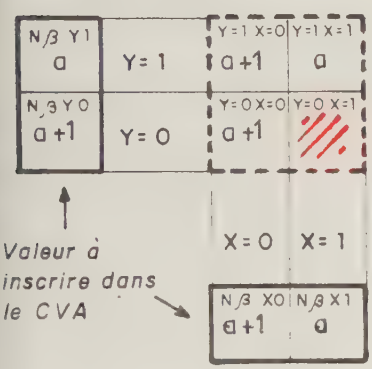

*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

*Valeur à inscrire dans le CVA*



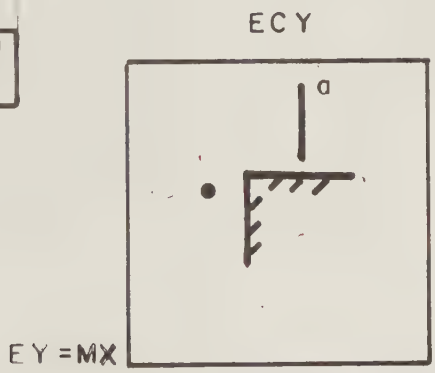

CAS N°10



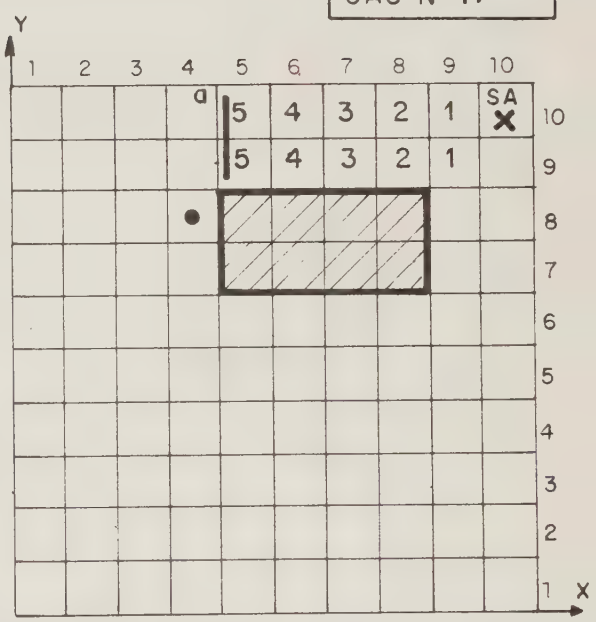



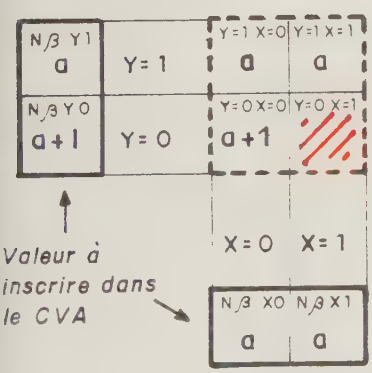

*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

*Valeur à inscrire dans le CVA*



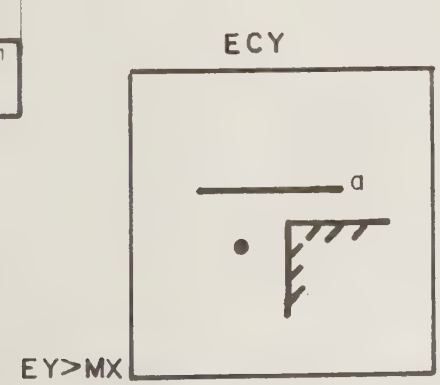

CAS N°11



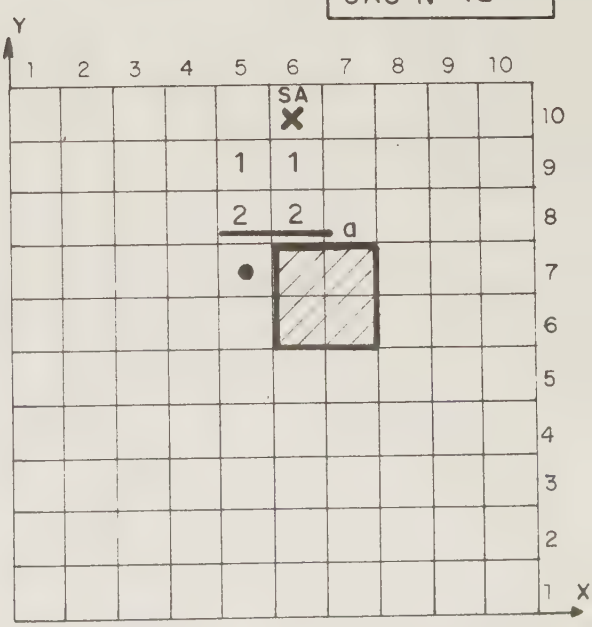




*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

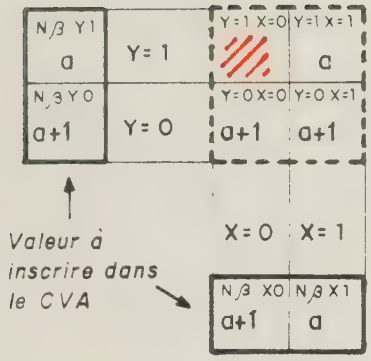
*Valeur à inscrire dans le CVA*




CAS N°12



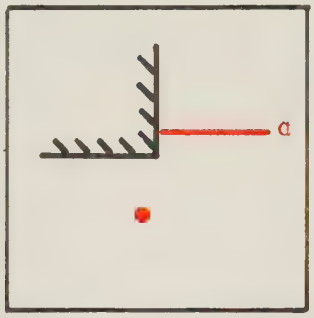
## CAS N° 13



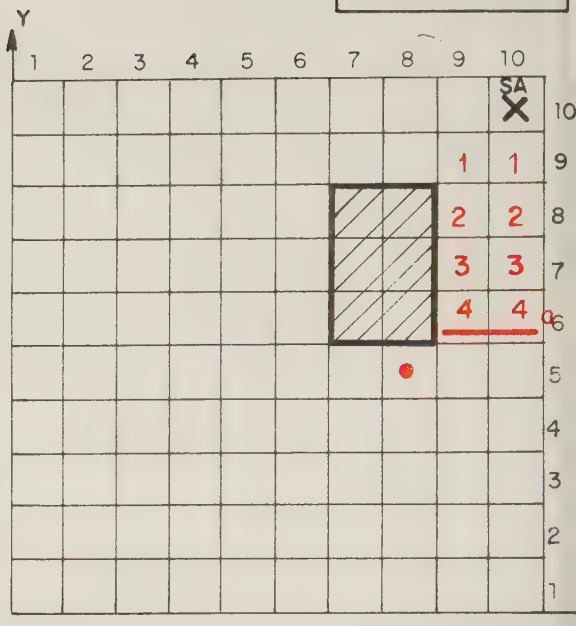

*Valeur à inscrire dans le CVA*

*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

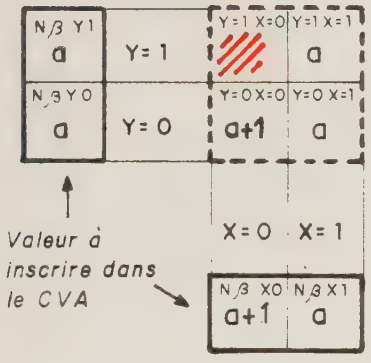
ECX




EX=MY



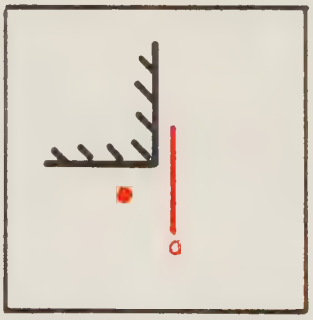

## CAS N° 14



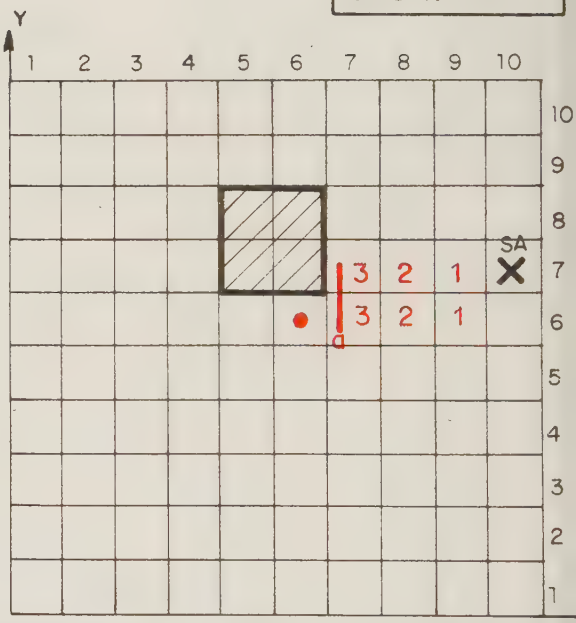

*Valeur à inscrire dans le CVA*

*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

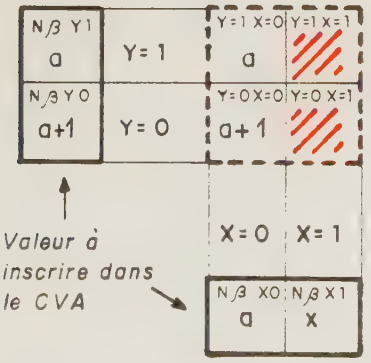
ECX




EX> MY



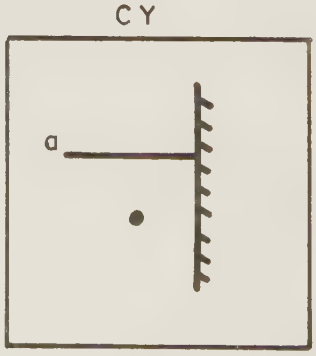

## CAS N° 15

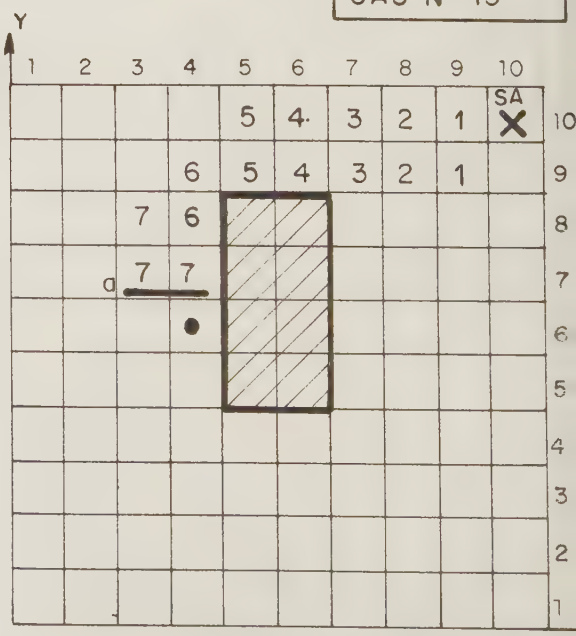


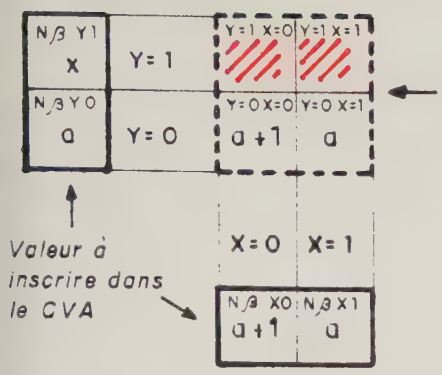

*Valeur à inscrire dans le CVA*

*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

CY

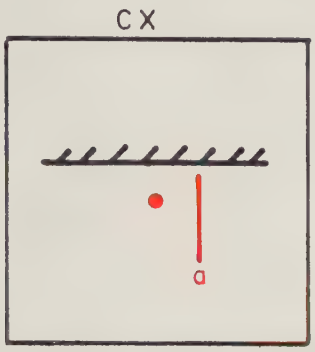


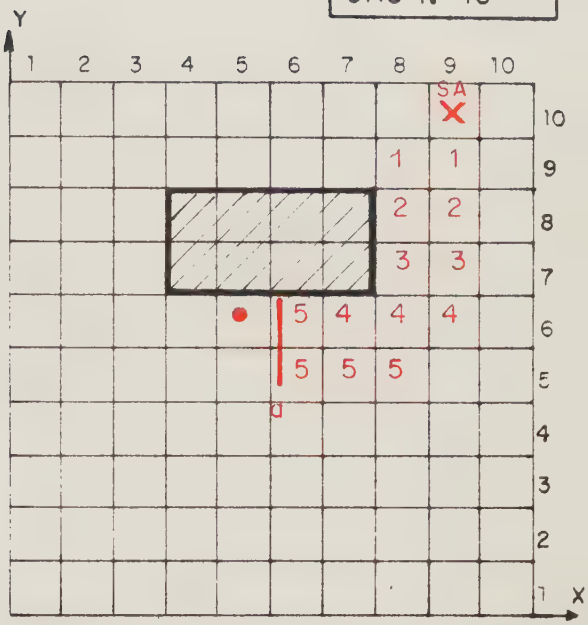


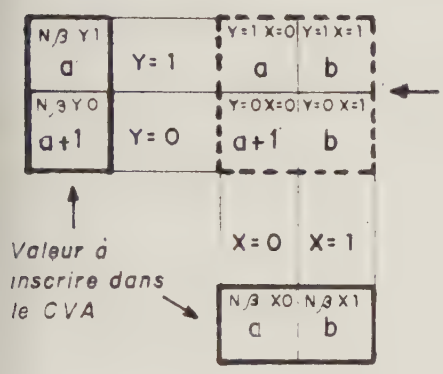

*Valeur à inscrire dans le CVA*

*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*



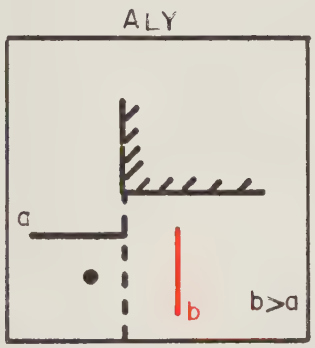

**CAS N° 16**



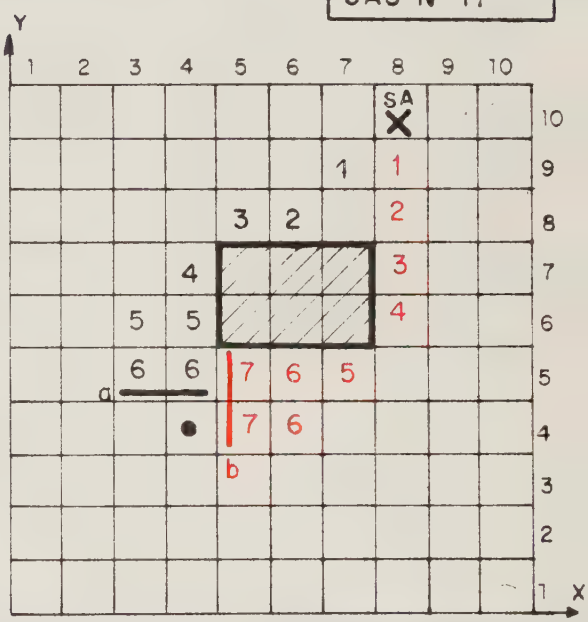

*Valeur à inscrire dans le CVA*

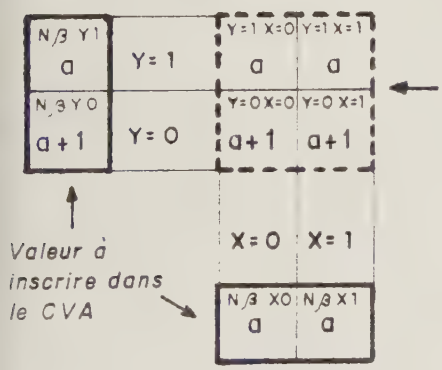
*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*




EY<EX

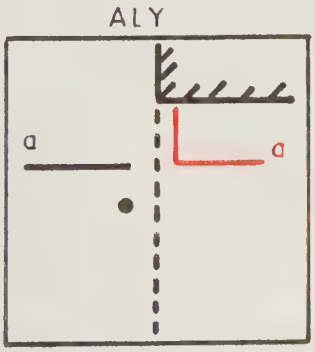
**CAS N° 17**



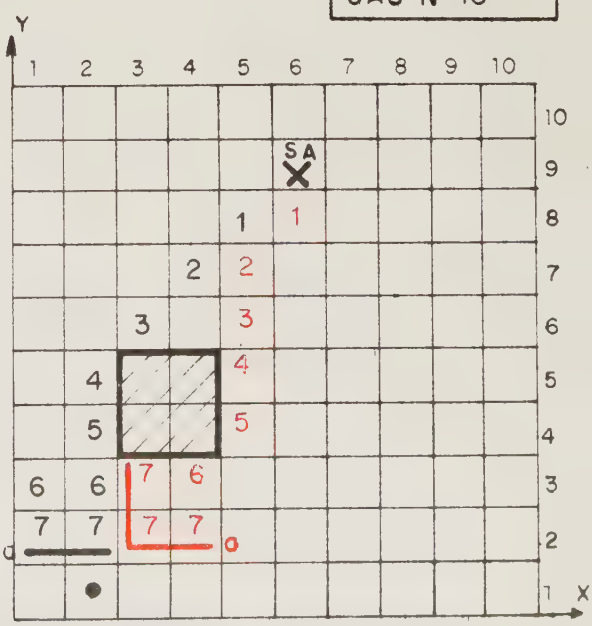

*Valeur à inscrire dans le CVA*

*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

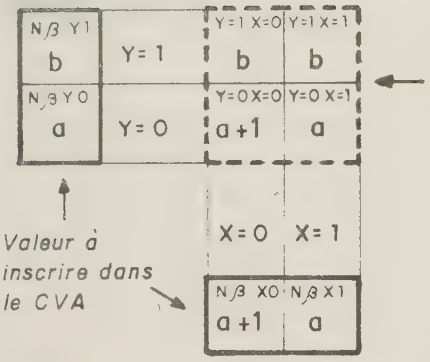



EY=EX=MY

**CAS N° 18**

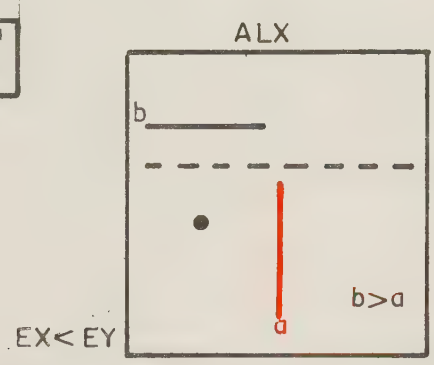


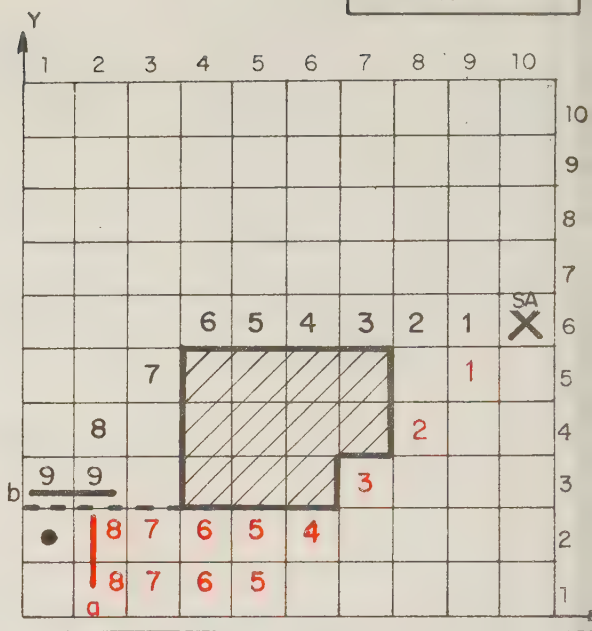
## CAS N°19




*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

*Valeur à inscrire dans le CVA*

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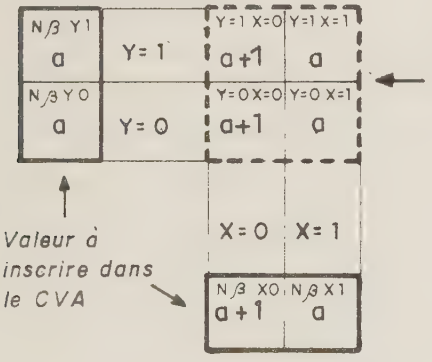
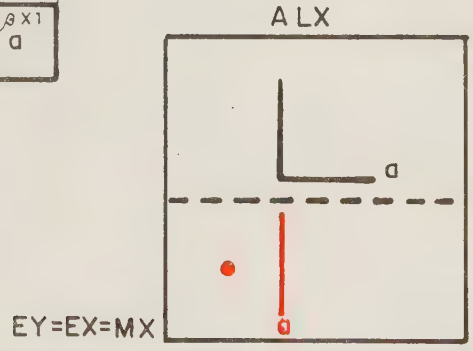
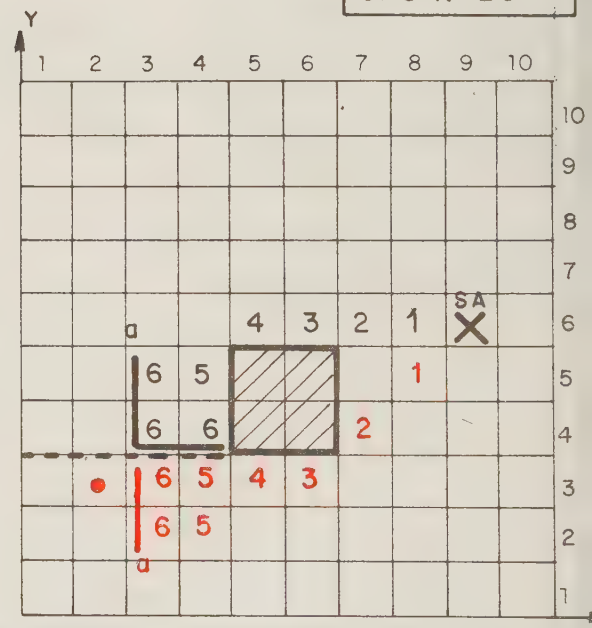


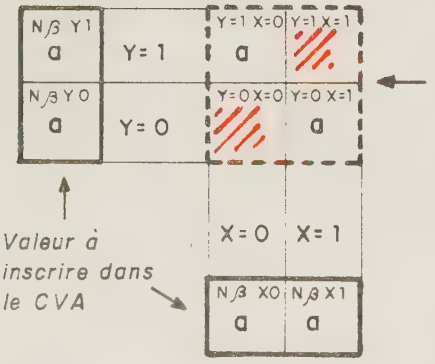

*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

*Valeur à inscrire dans le CVA*



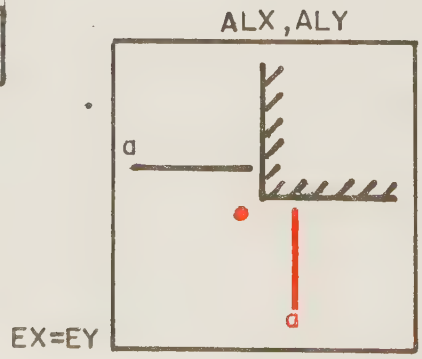



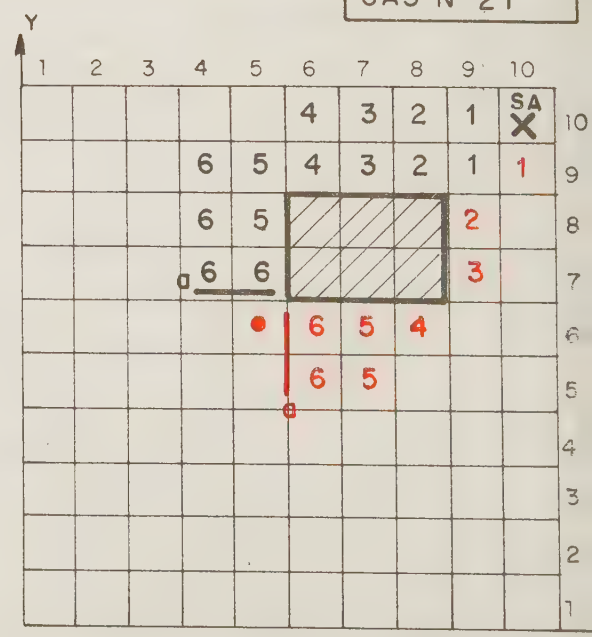

## CAS N°21

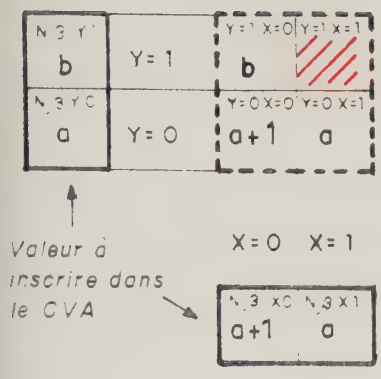



*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

*Valeur à inscrire dans le CVA*



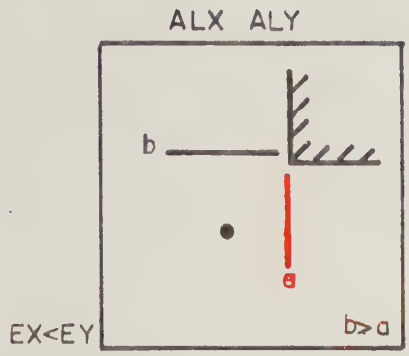



*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

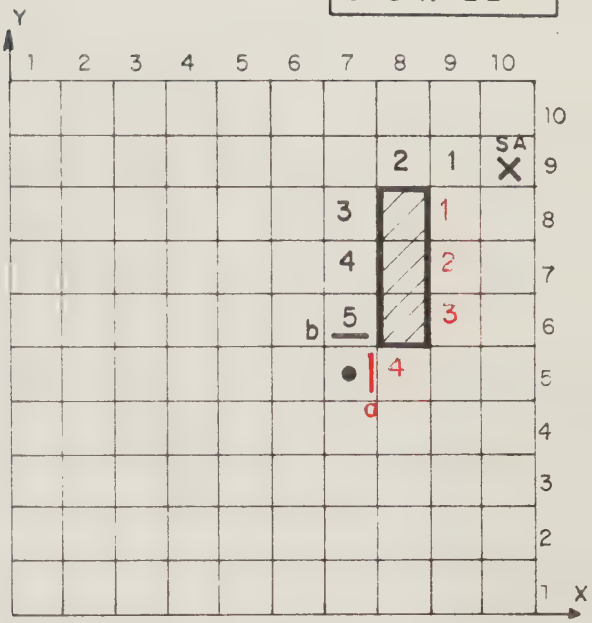
*Valeur à inscrire dans le CVA*

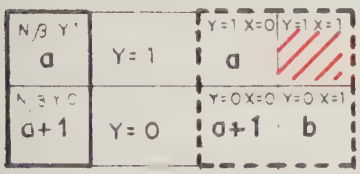
X=0 X=1




CAS N°22

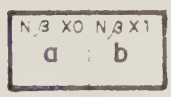


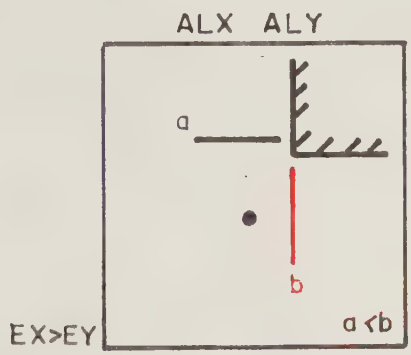




*Nombre de pas β nécessaires, pour que l'un des 4 couples d'action (00,01,10,11) soit possible*

*Valeur à inscrire dans le CVA*

X=0 X=1

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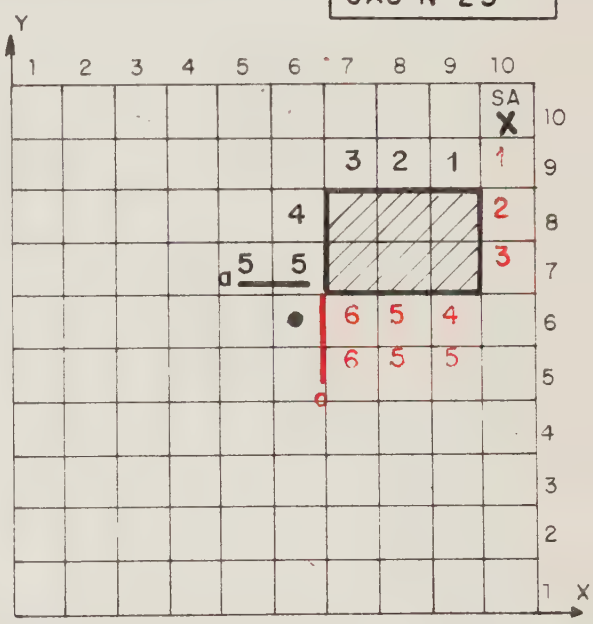


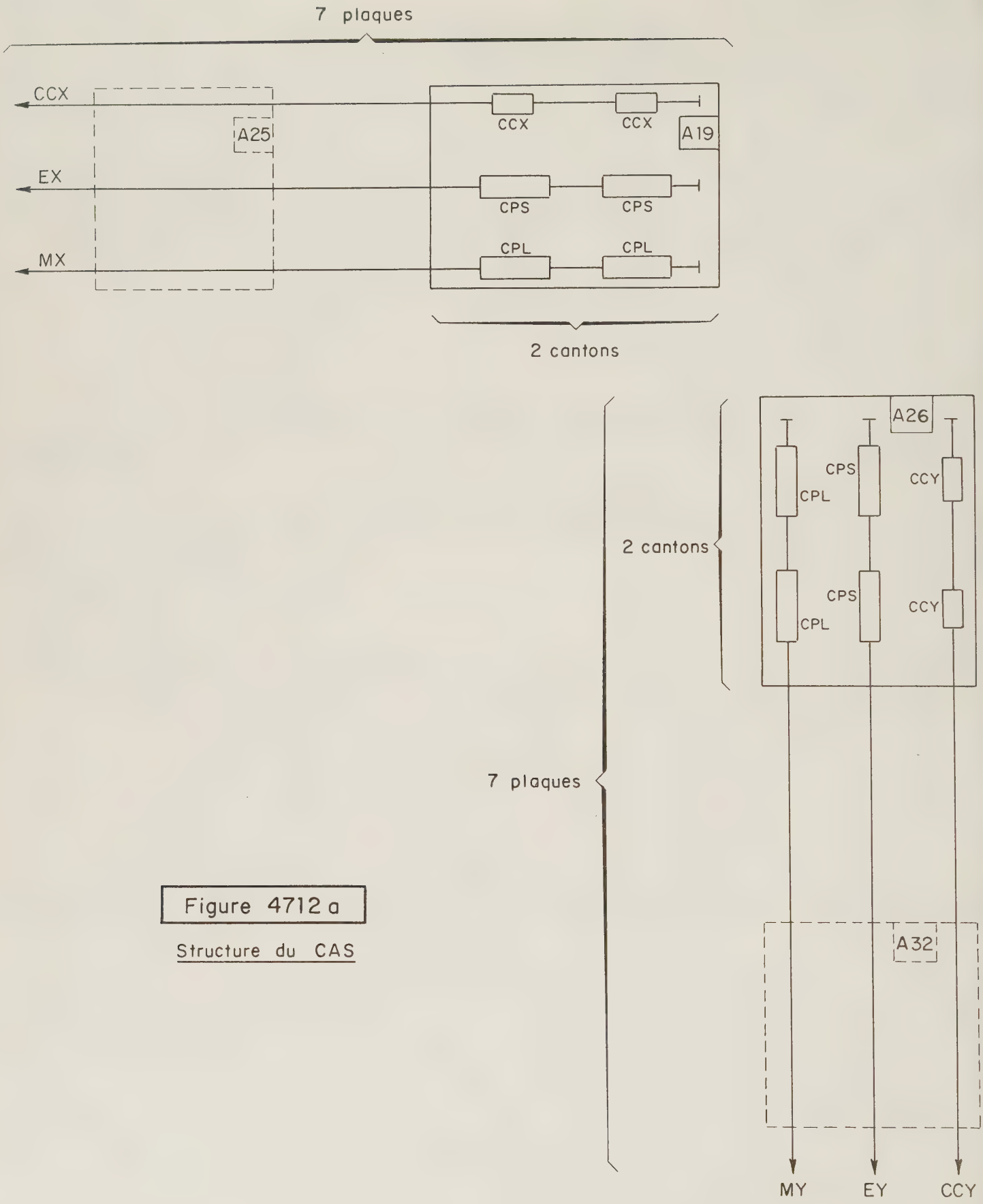



Figure 4712 a

Structure du CAS

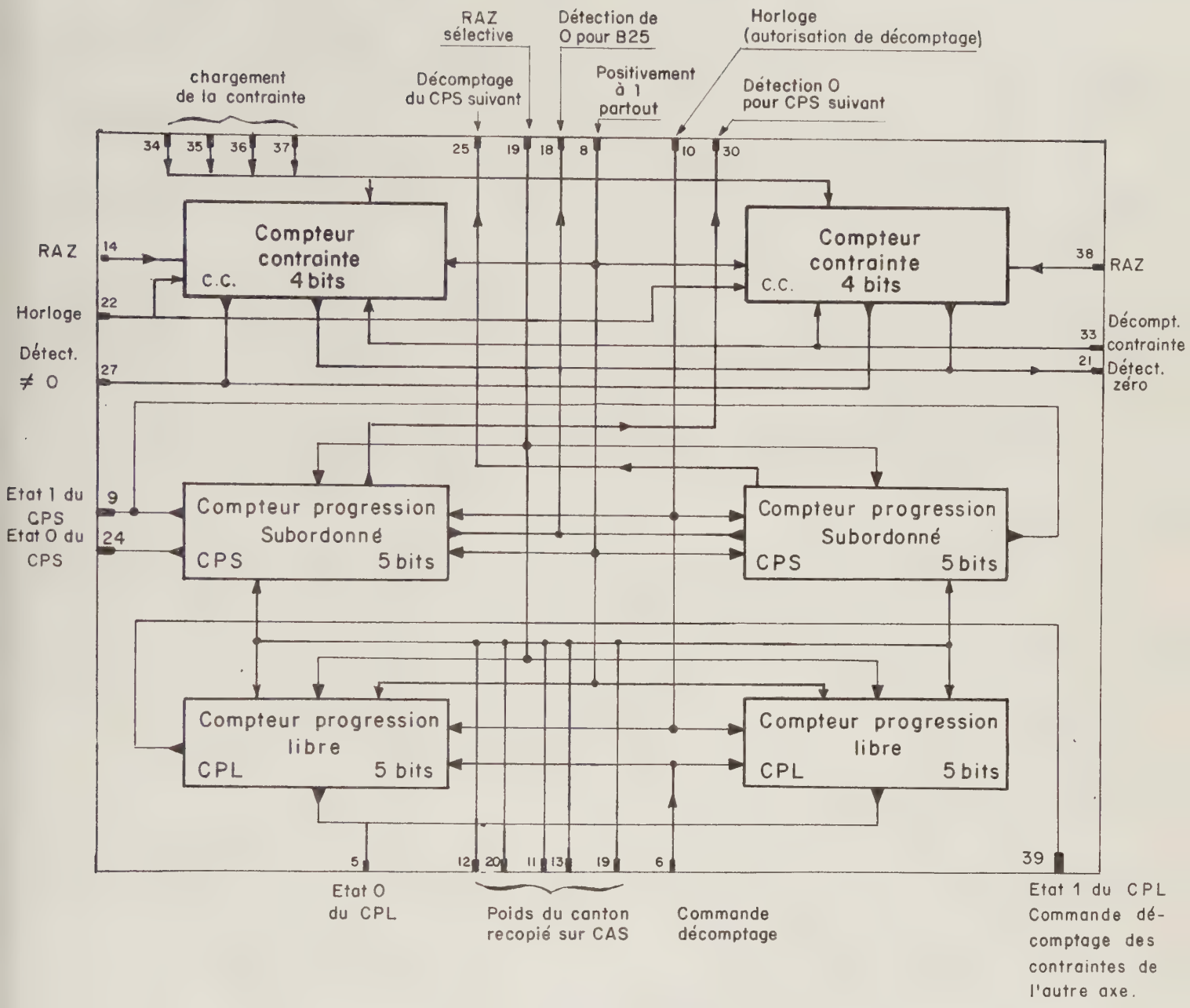



**Figure 4712 b**

Réalisation d'une plaque CAS

Schéma simplifié de la plaque B 25

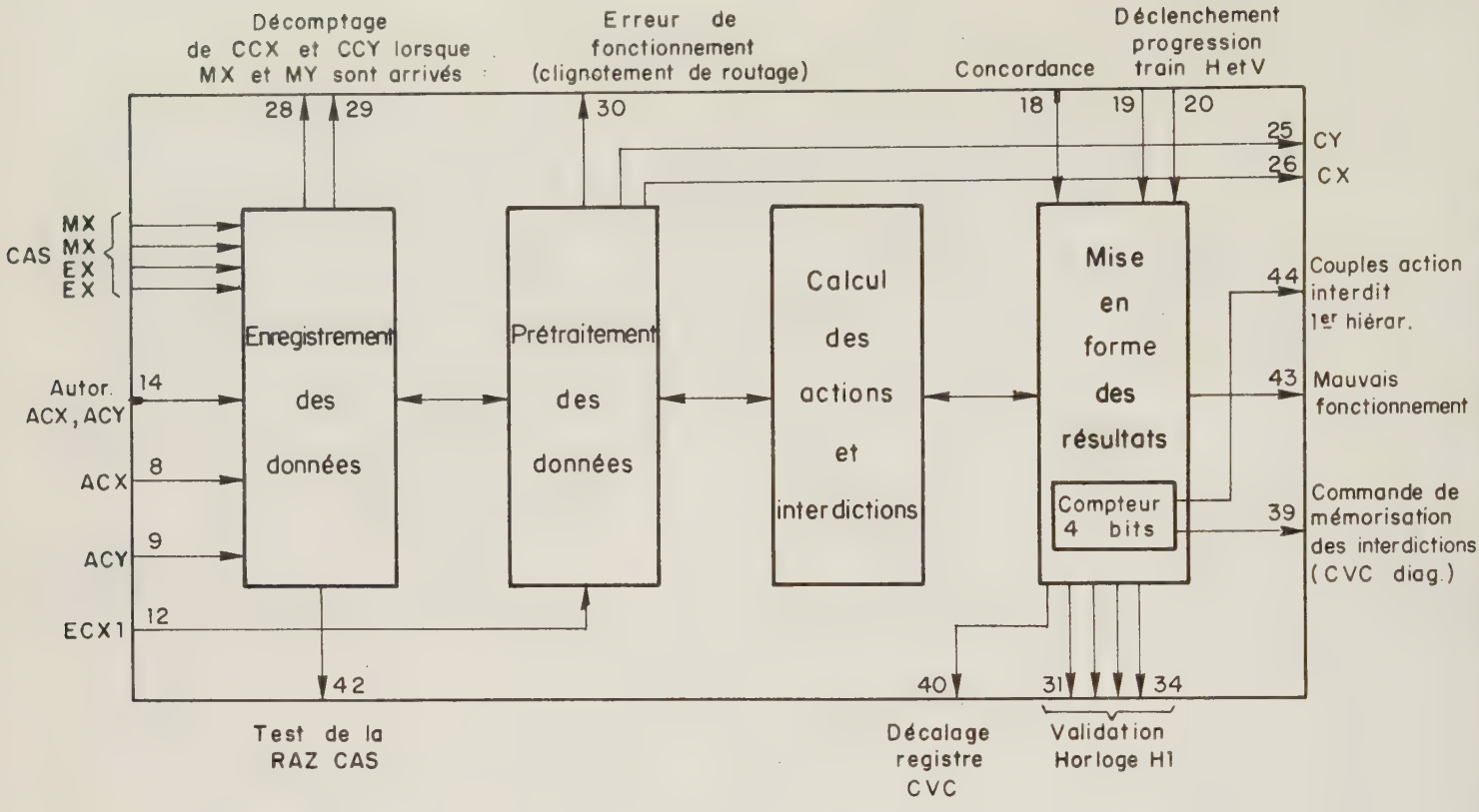



Figure 4713a

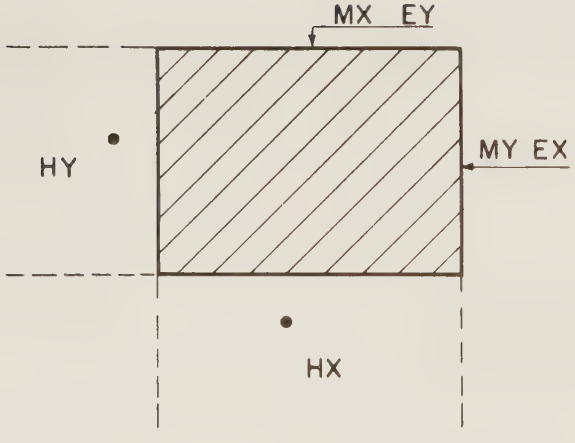



Figure 4713b

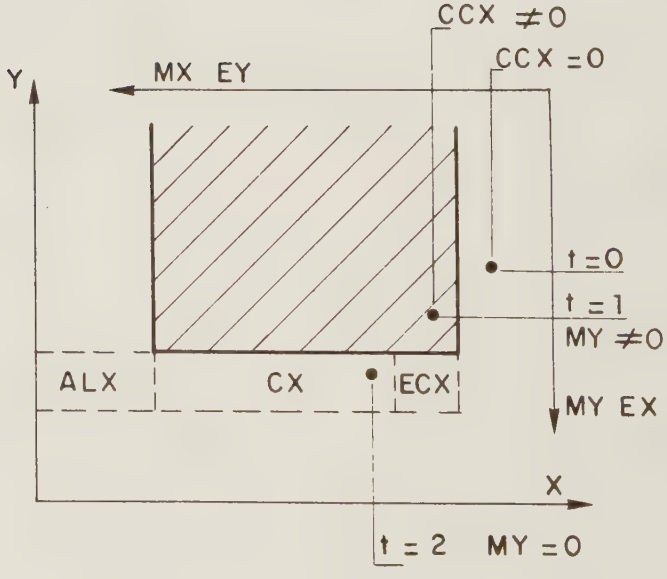



Figure 4713c

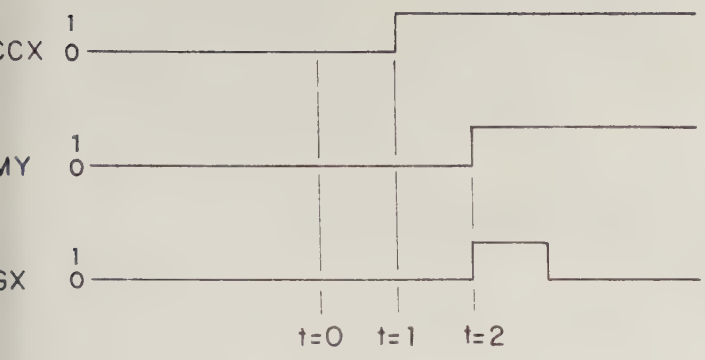



Figure 4713 d

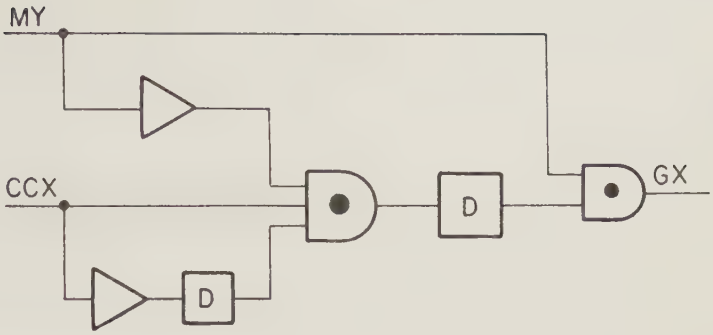



Figure 4713 e

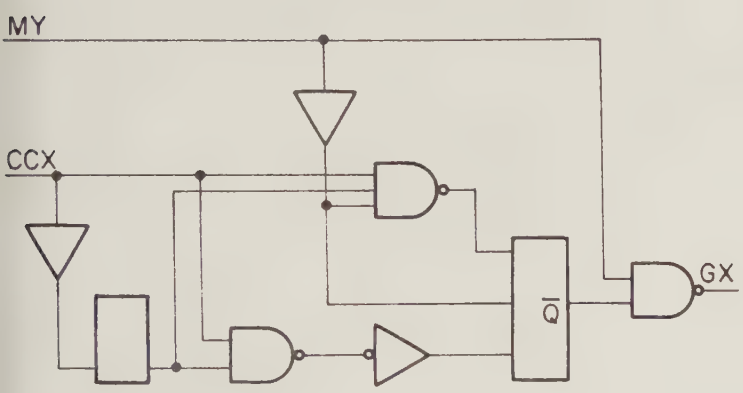



Figure 4713 f

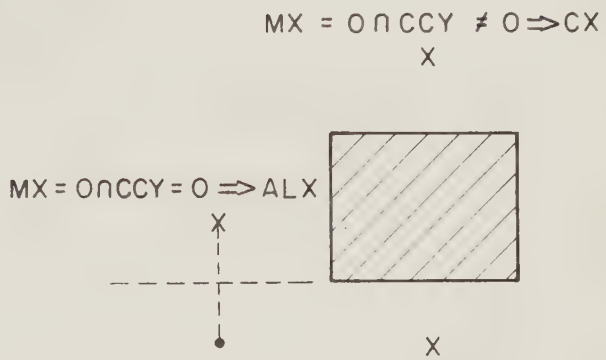



Figure 4713 g

Figure 4713 h

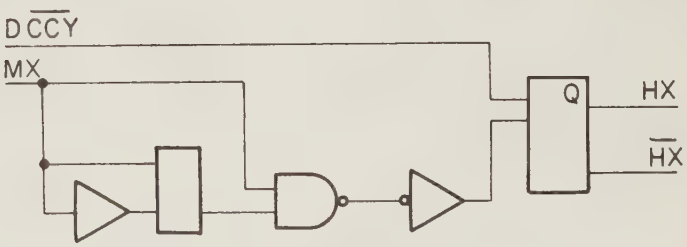



Figure 4713 j

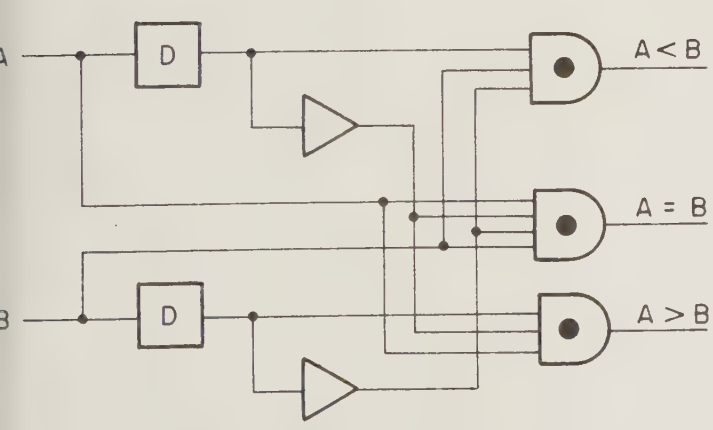



Figure 4713 k

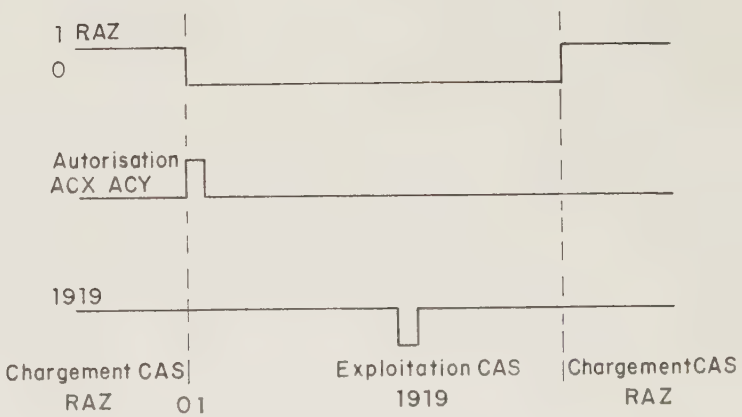
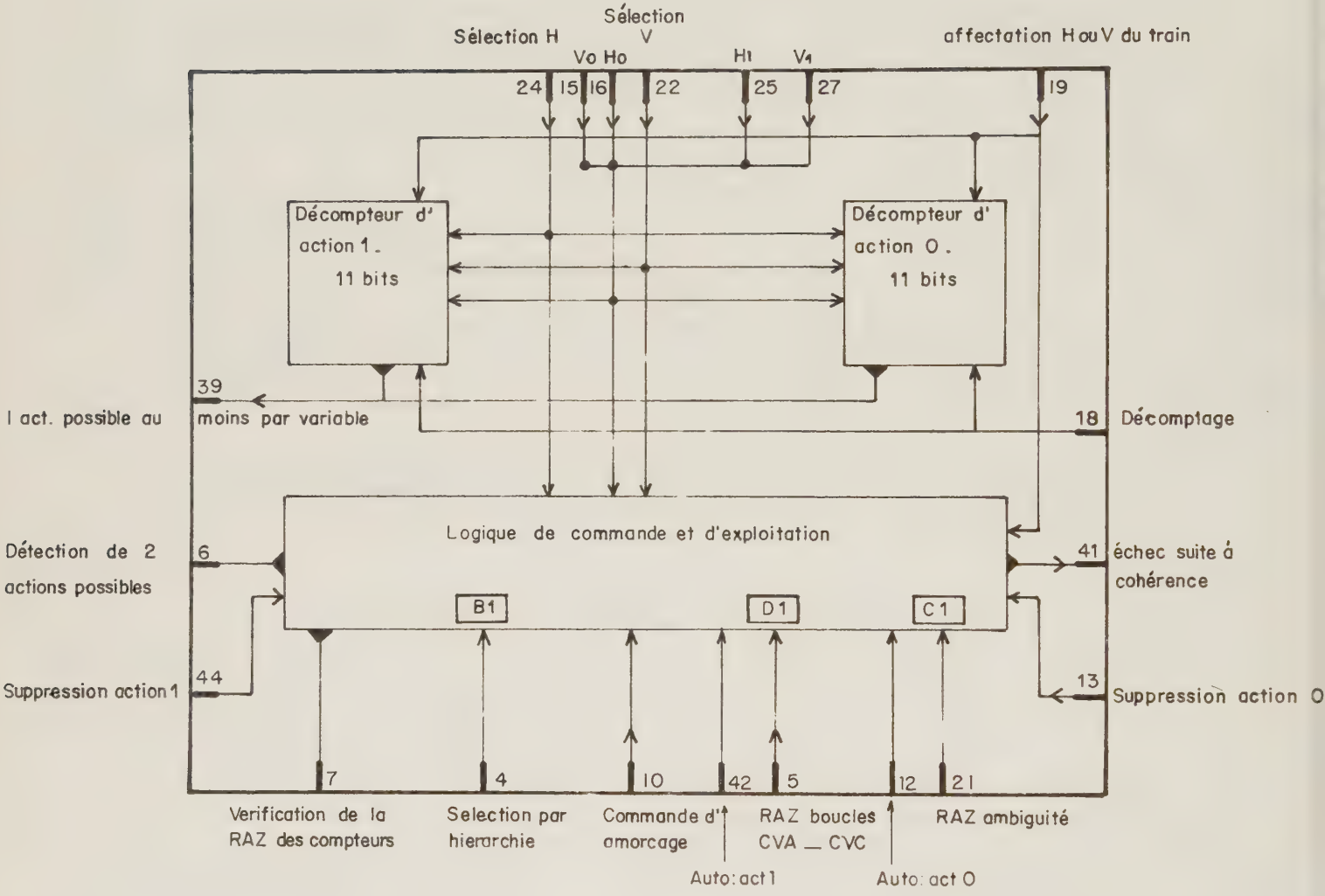



Figure 4713 ℓ

71.03.24-2770/RK

Fig. 4722a

# Plaque du centre de validation d'action (C.V.A.)



# Mécanisme de décomptage CVA

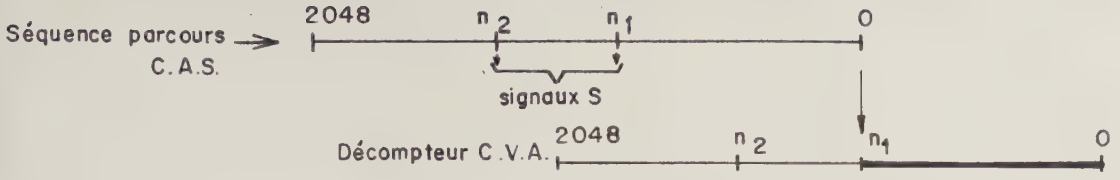



Fig. 4722 b1 ( Etat initial )

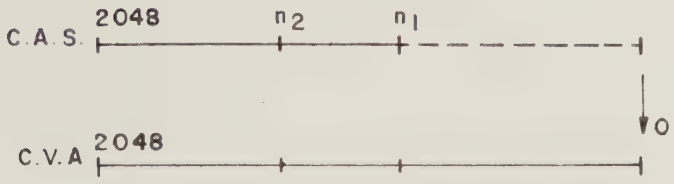



Fig. 4722 $b_2$ ( Décomptage de $n_1$ dans CVA )

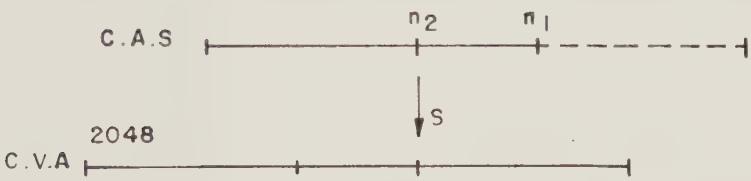



Fig. 4722 $b_3$ (Blocage du C.V.A. pendant $n_2 - n_1$)

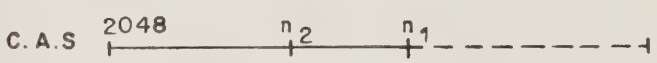


Fig. 4722 $b_4$ (Chargement du C.V.A. à $n_2$ par décomptage de $2048 - n_2$)

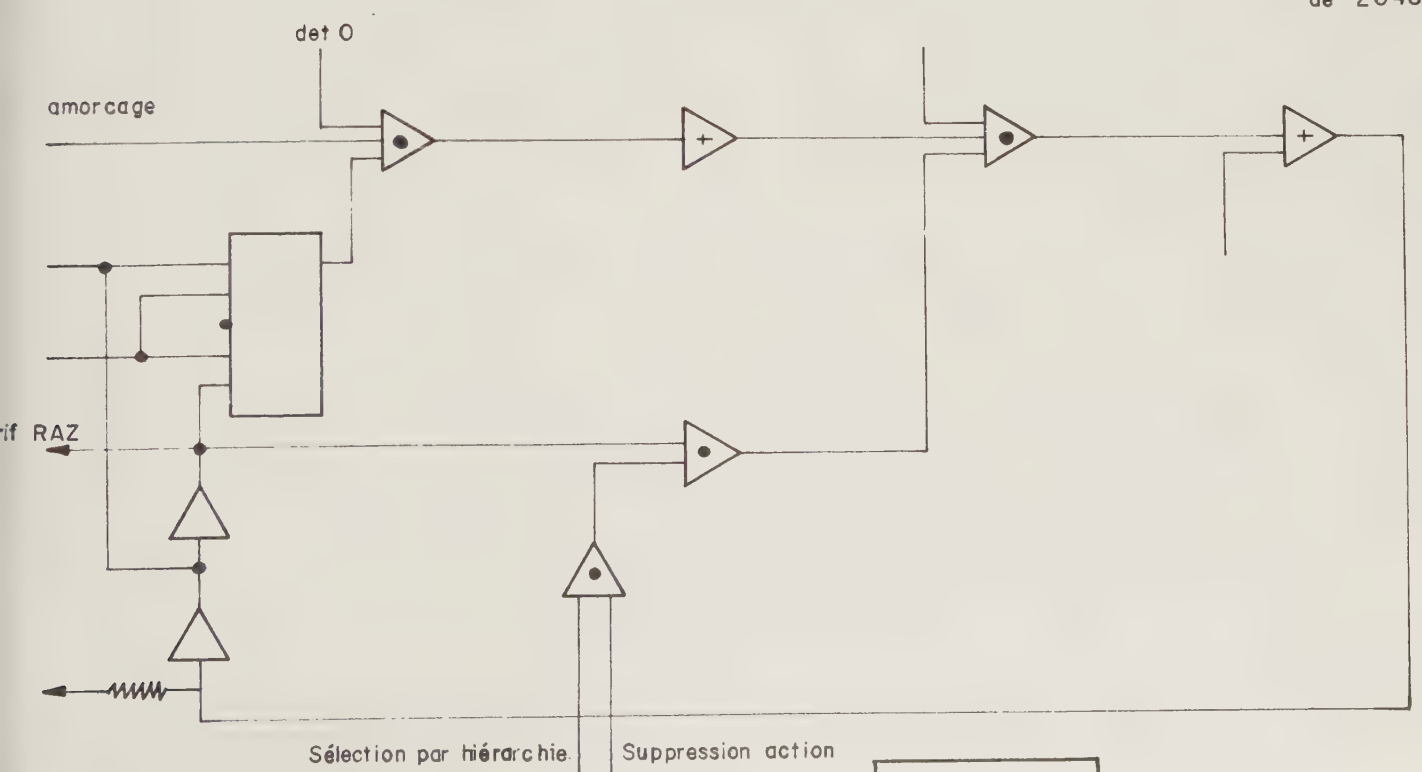
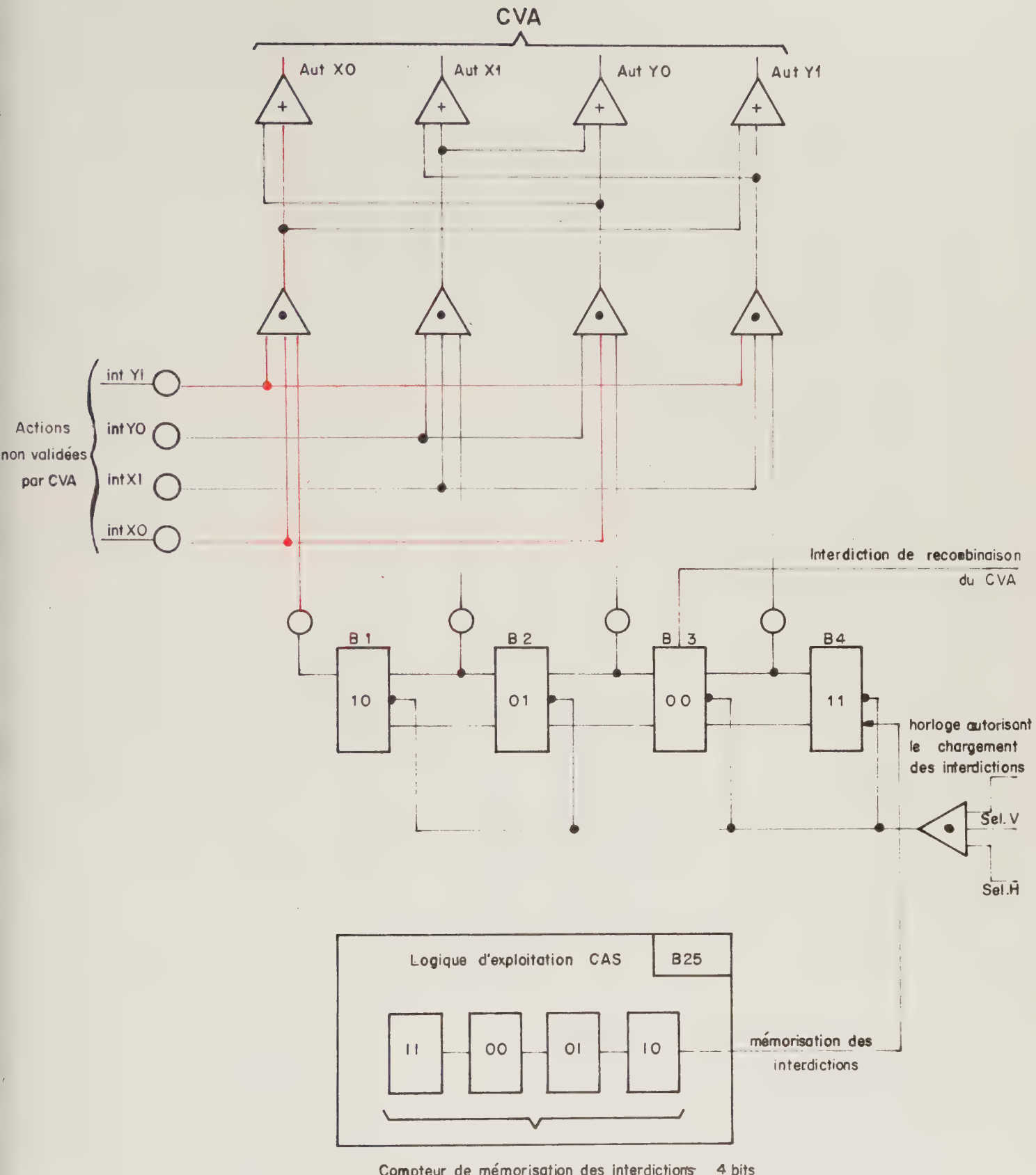



Fig. 4722 c Boucle CVA–CVC

71.04.19-2893/RK

Fig 473a

## schéma fonctionnel d'un module élémentaire de CVC




Compteur de mémorisation des interdictions 4 bits

Fig. 473 b

Structure C.V.C.

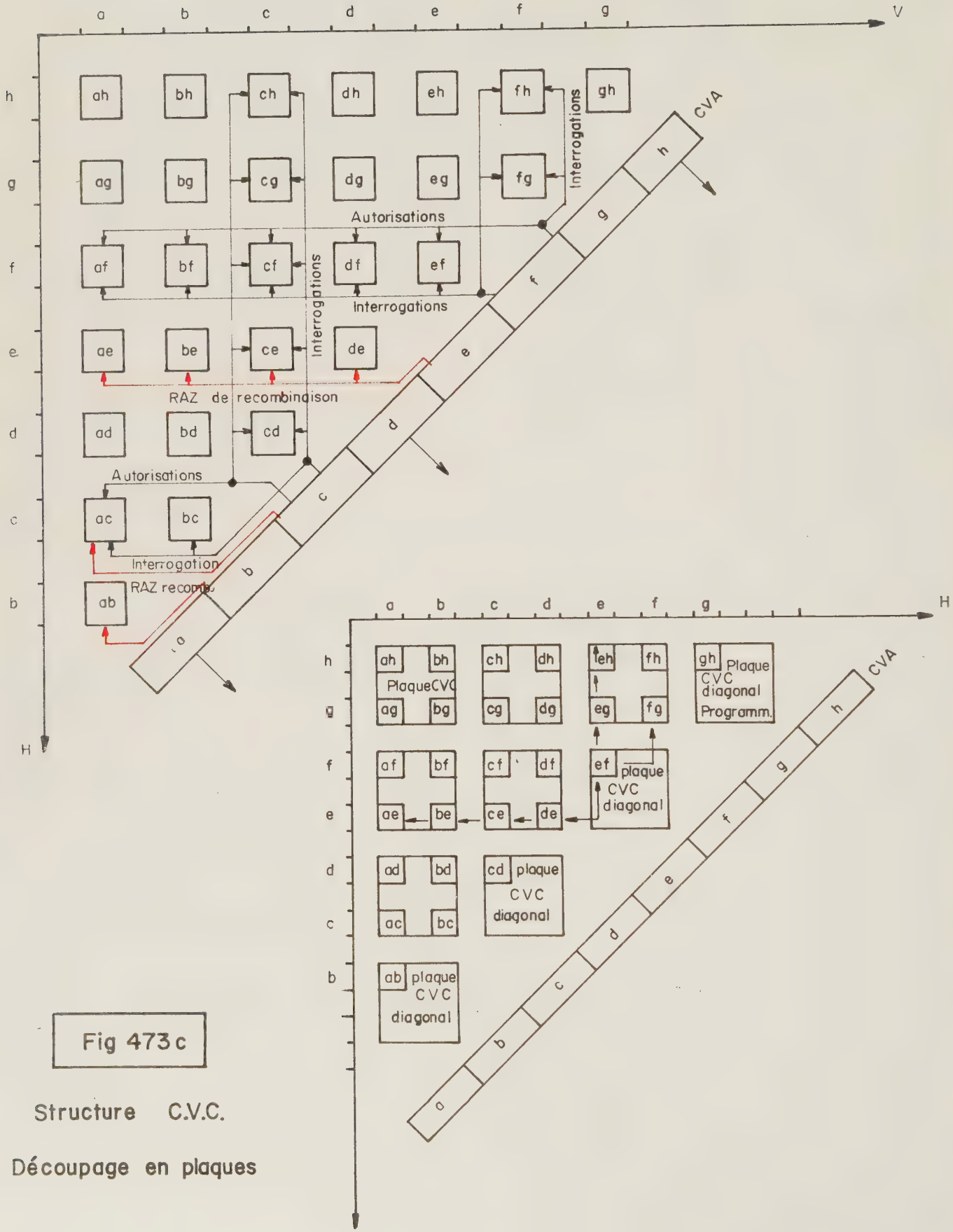



Fig 473 c

Structure C.V.C.

Découpage en plaques

Fig. 473 d

## Module C V C

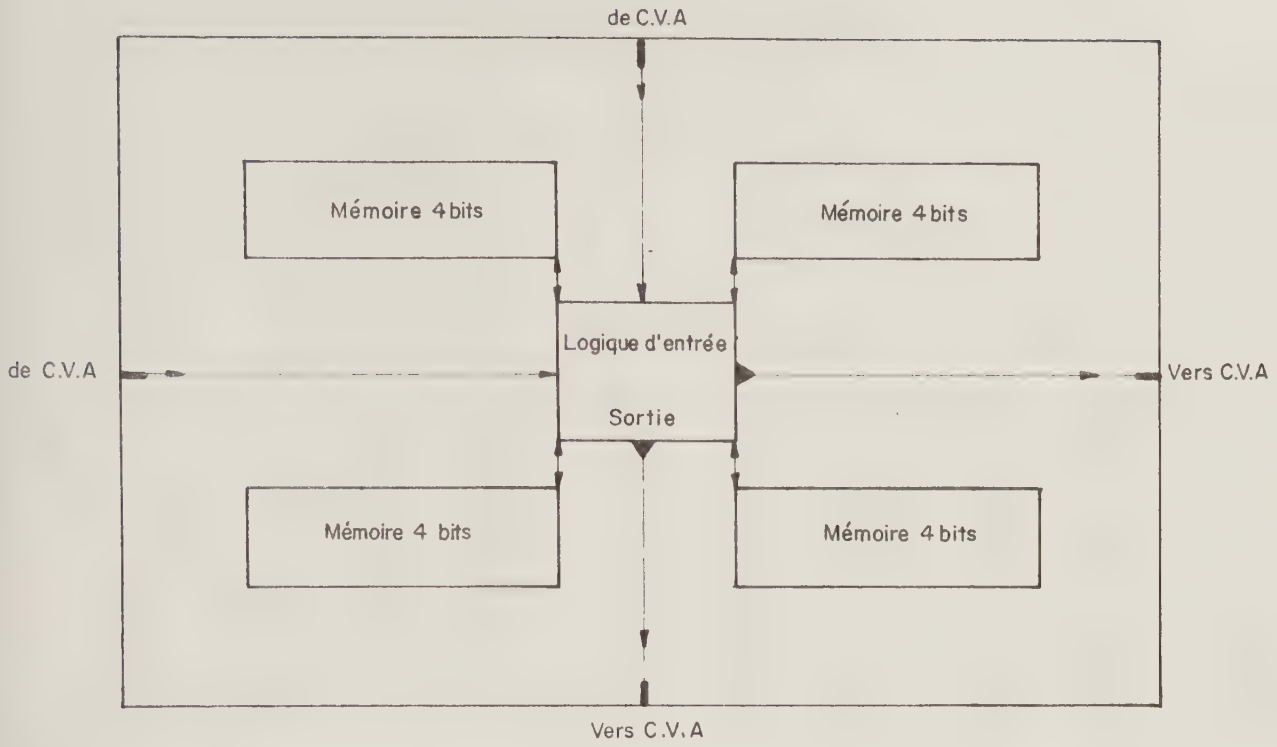



Fig. 473 e

## " Module CVC diagonal "

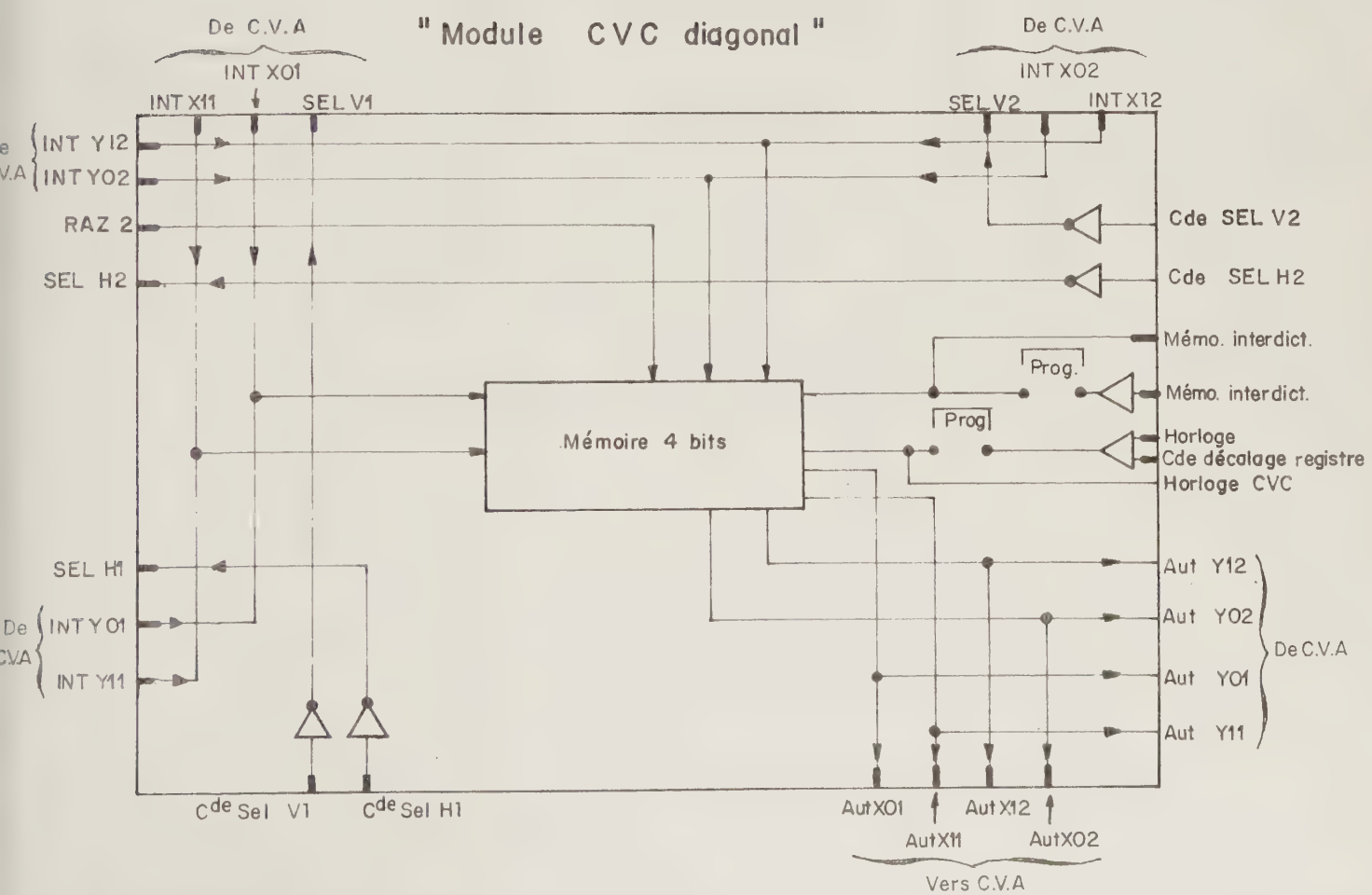
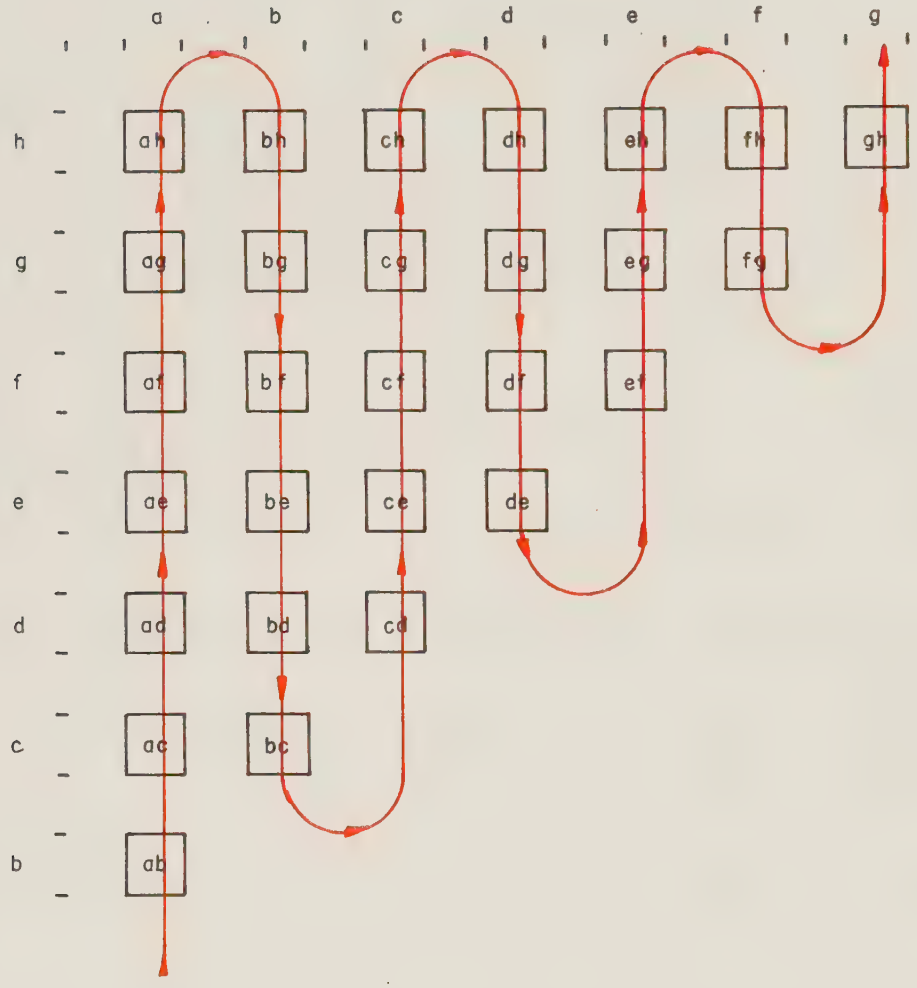


Fig. 473 f




Chargement des registres C.V.C.

# Module "Situation trains"

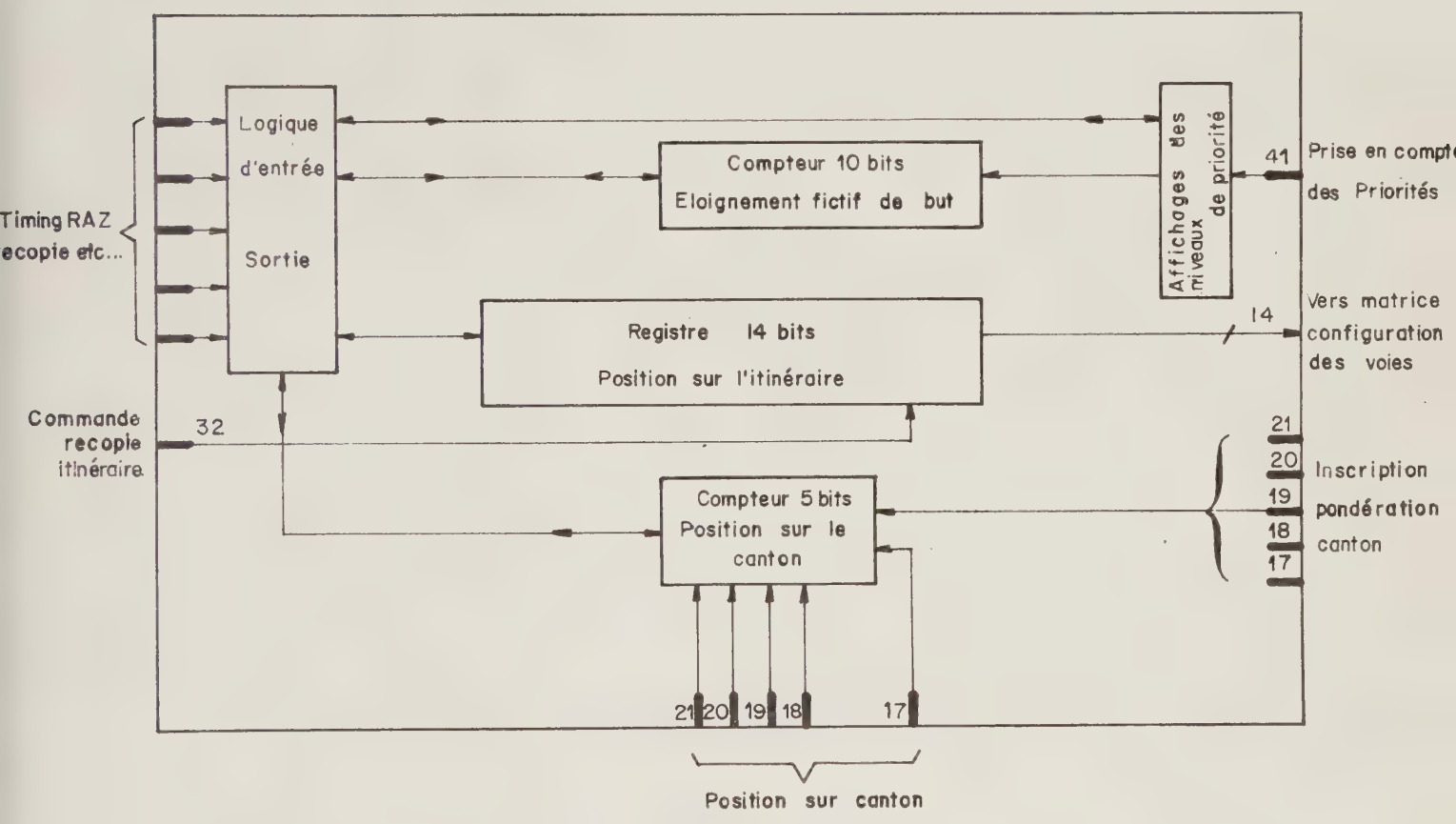



Fig. 4742 a

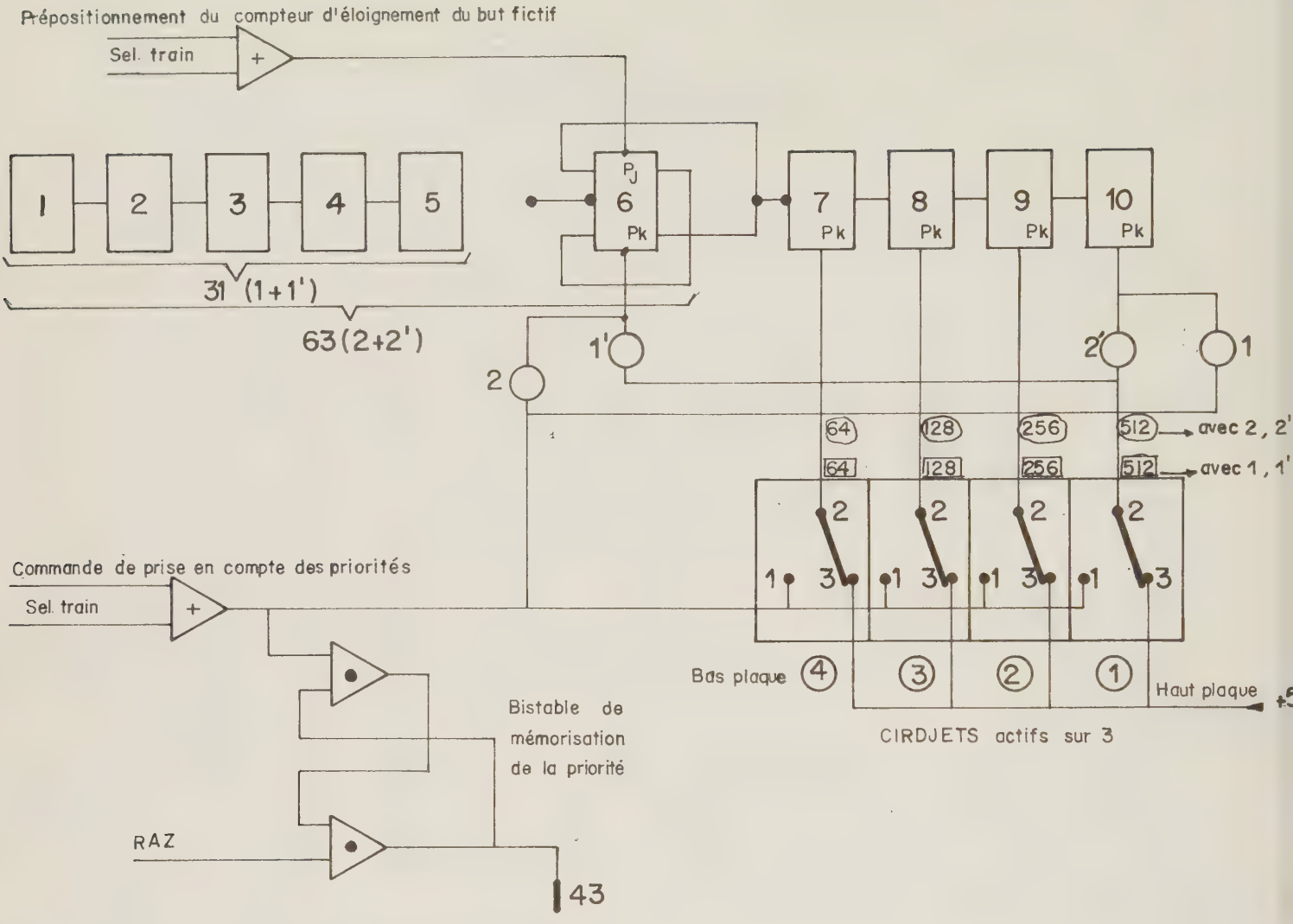



Fig. 4742 b Compteur d'éloignement de but fictif

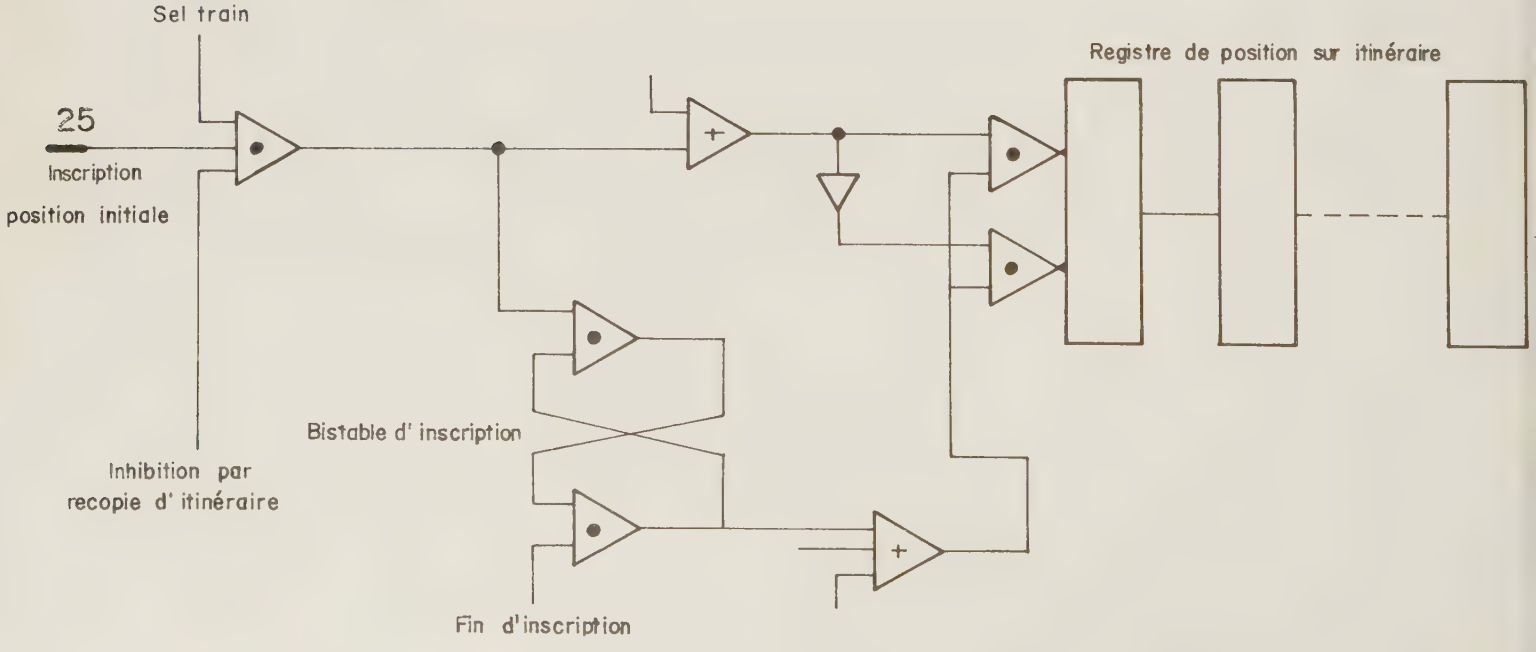



Fig. 4742 c Inscription position initiale

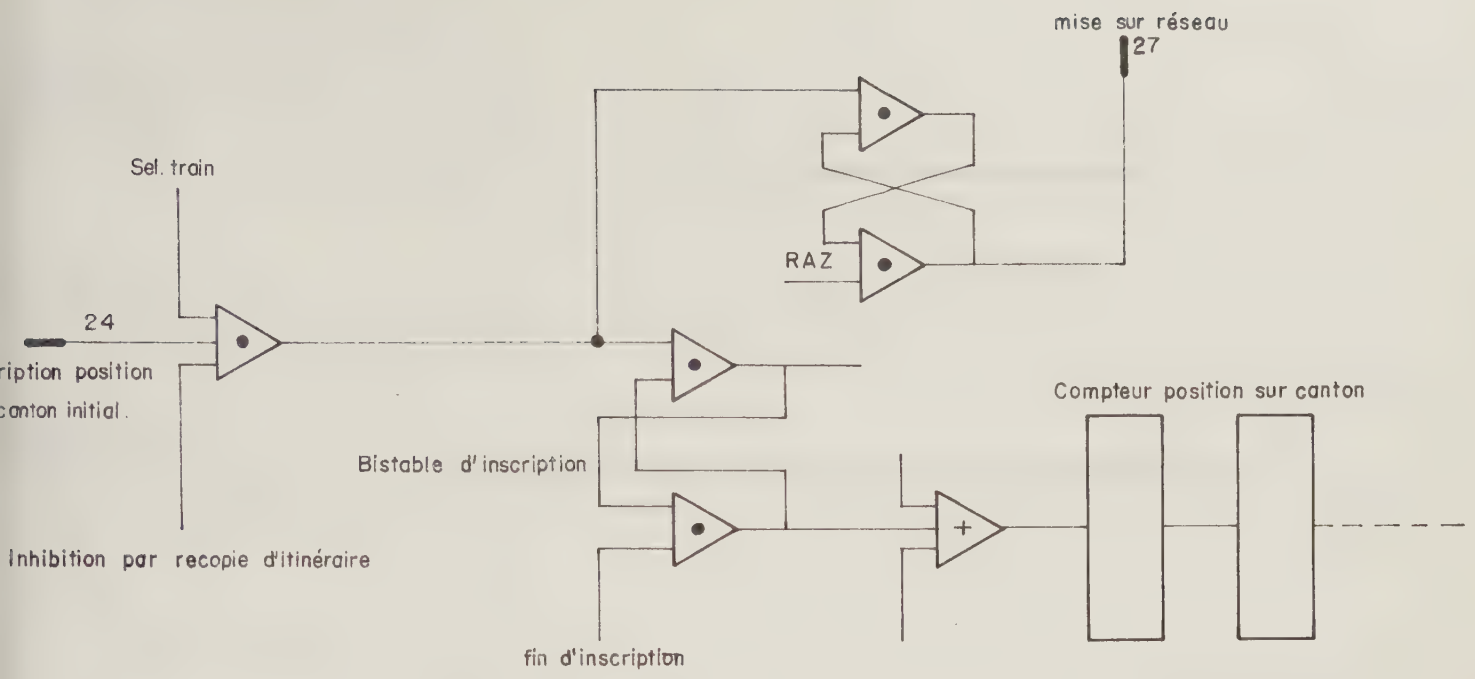



Fig. 4742 d — Inscription position sur canton initial

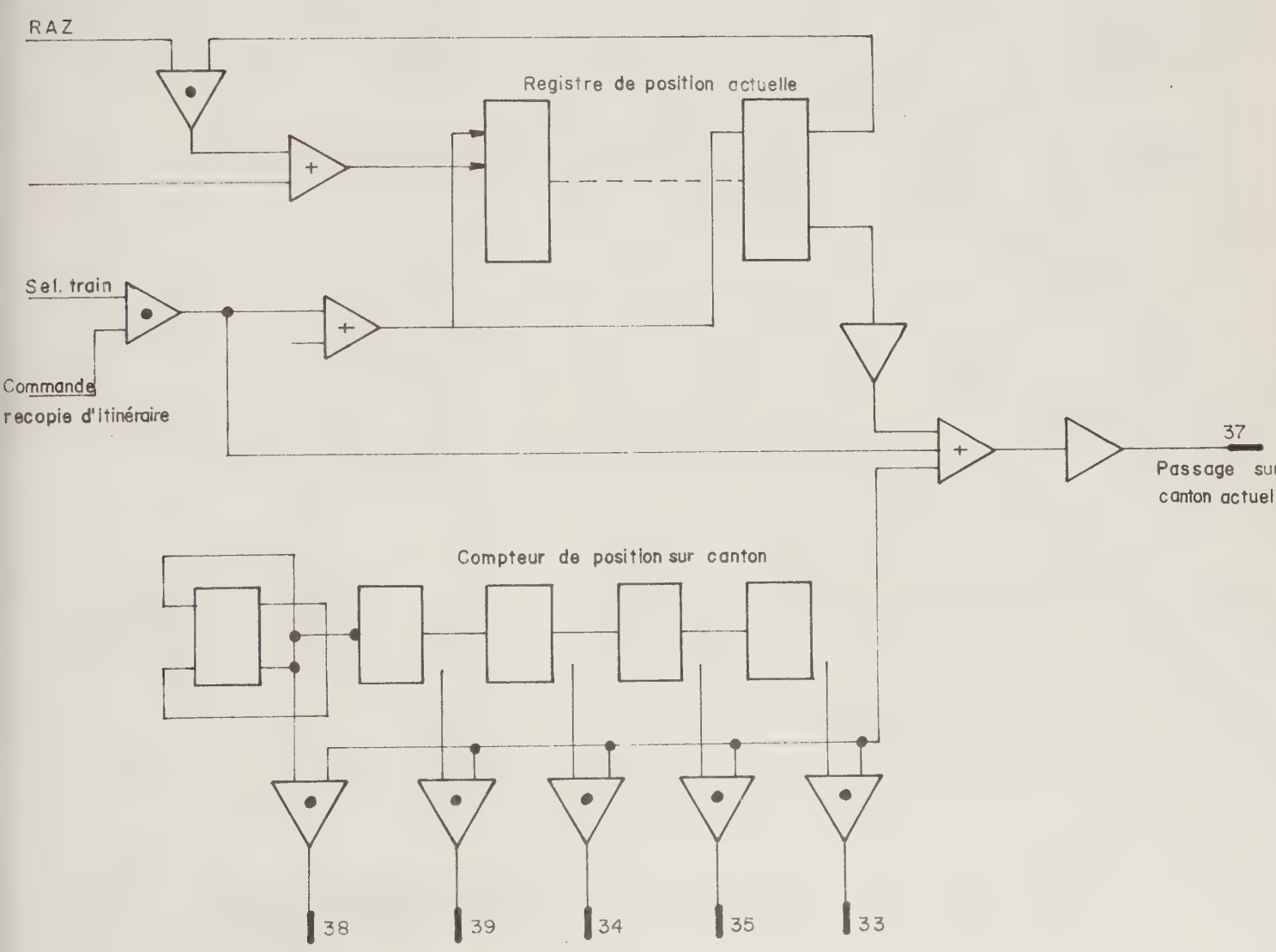



Fig. 4742 e — Recopie d'itinéraire sur le C.A.S.

74.04.16-2874/RK

Fig. 4742 f

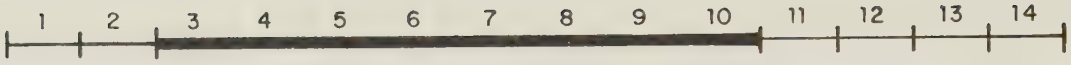



Fig. 4742g

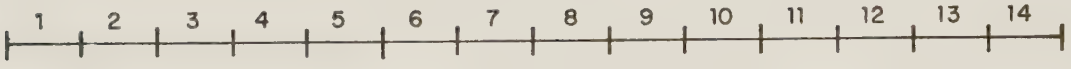
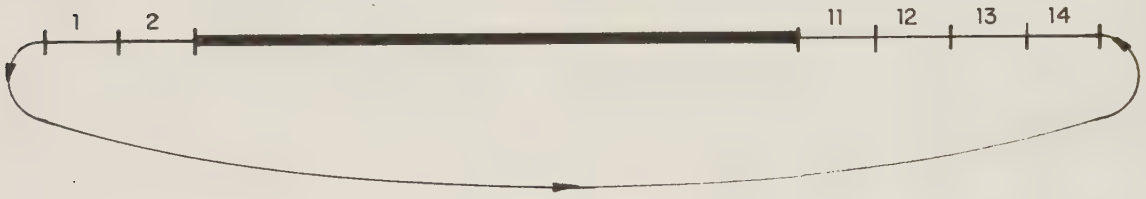



Fig. 4742h




Fonctionnement du compteur de position initial sur l'itinéraire

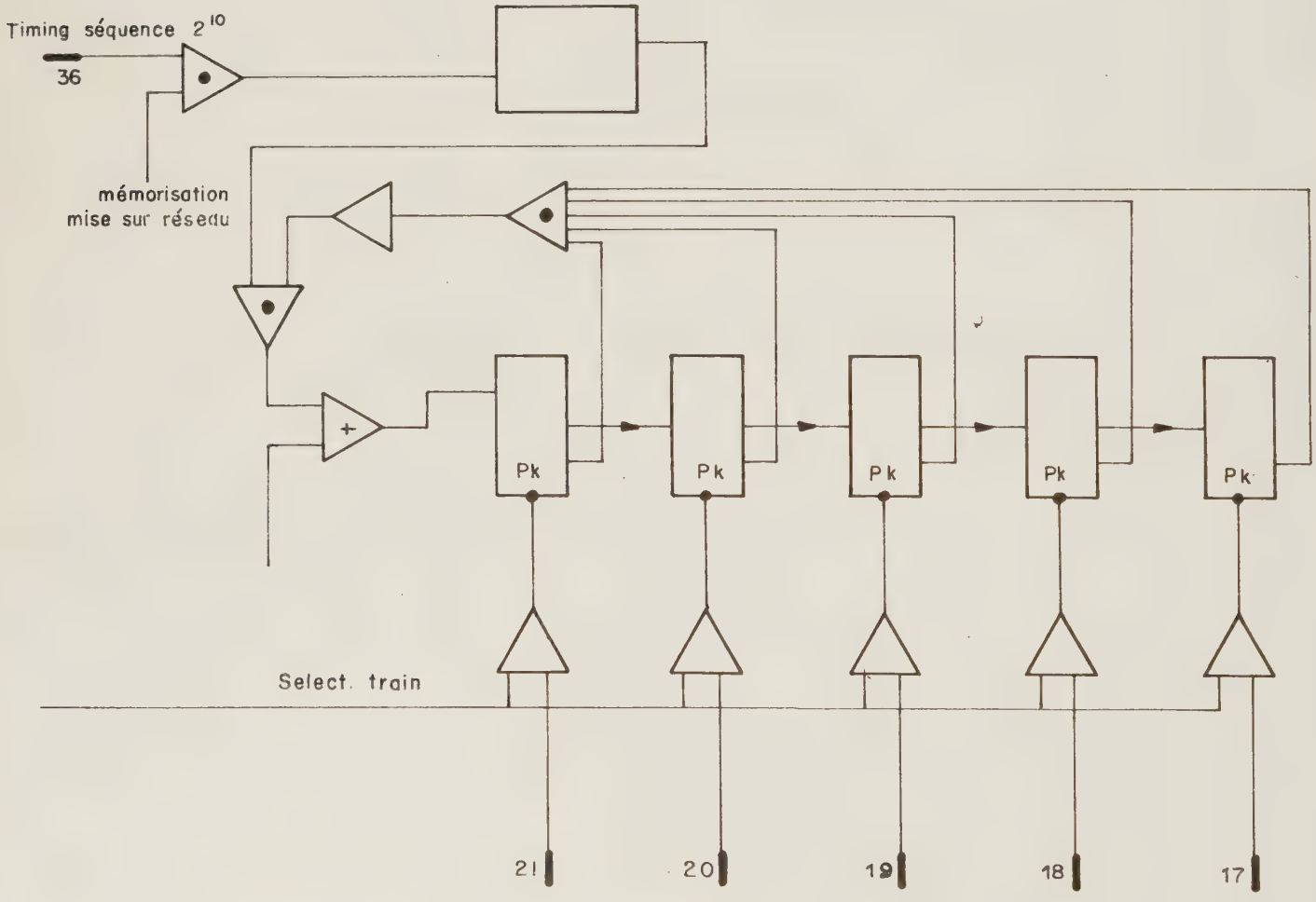



Fig. 4742 j

Inscription de la pondération d'un canton

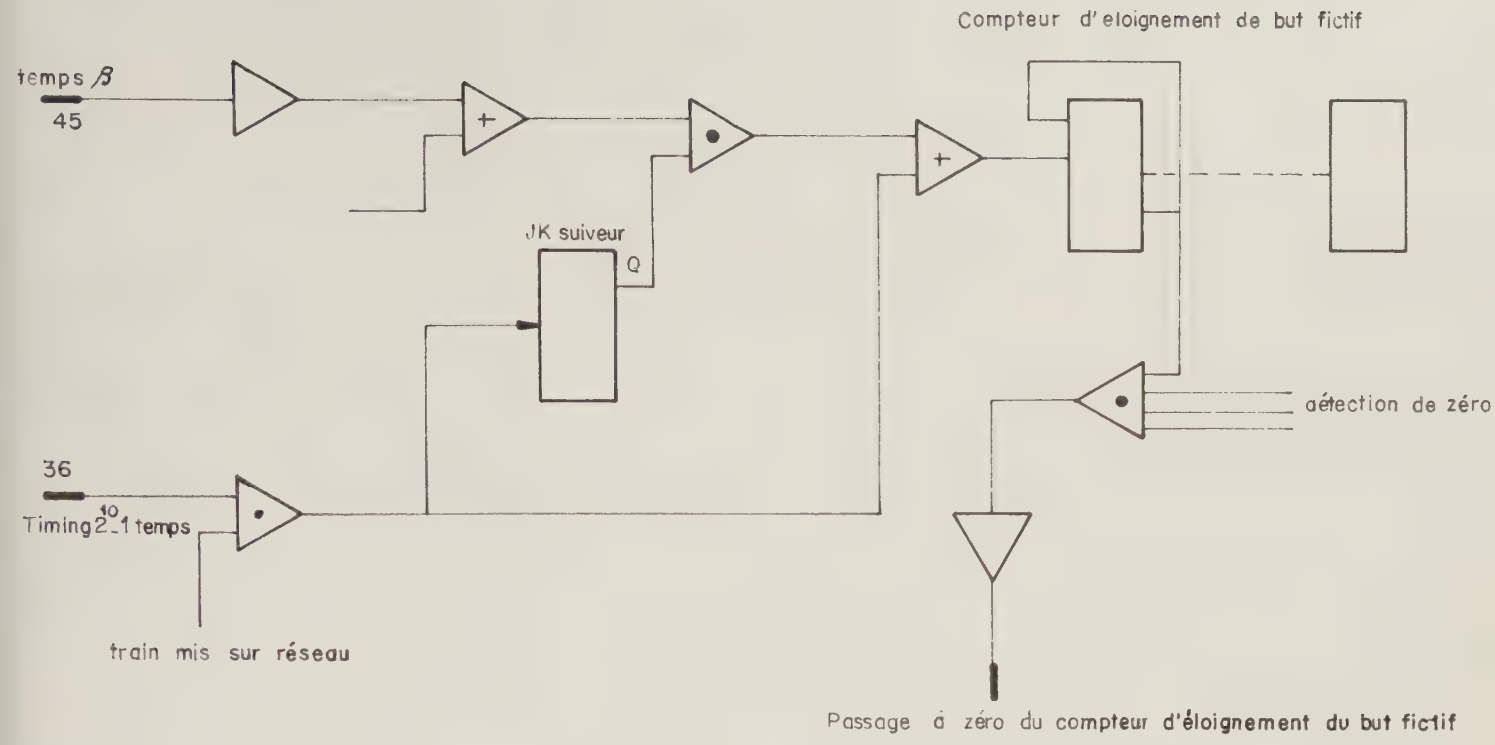



Fig. 4742 l Fonctionnement du compteur d'éloignement fictif de but au cours de l'exploration $\beta$.

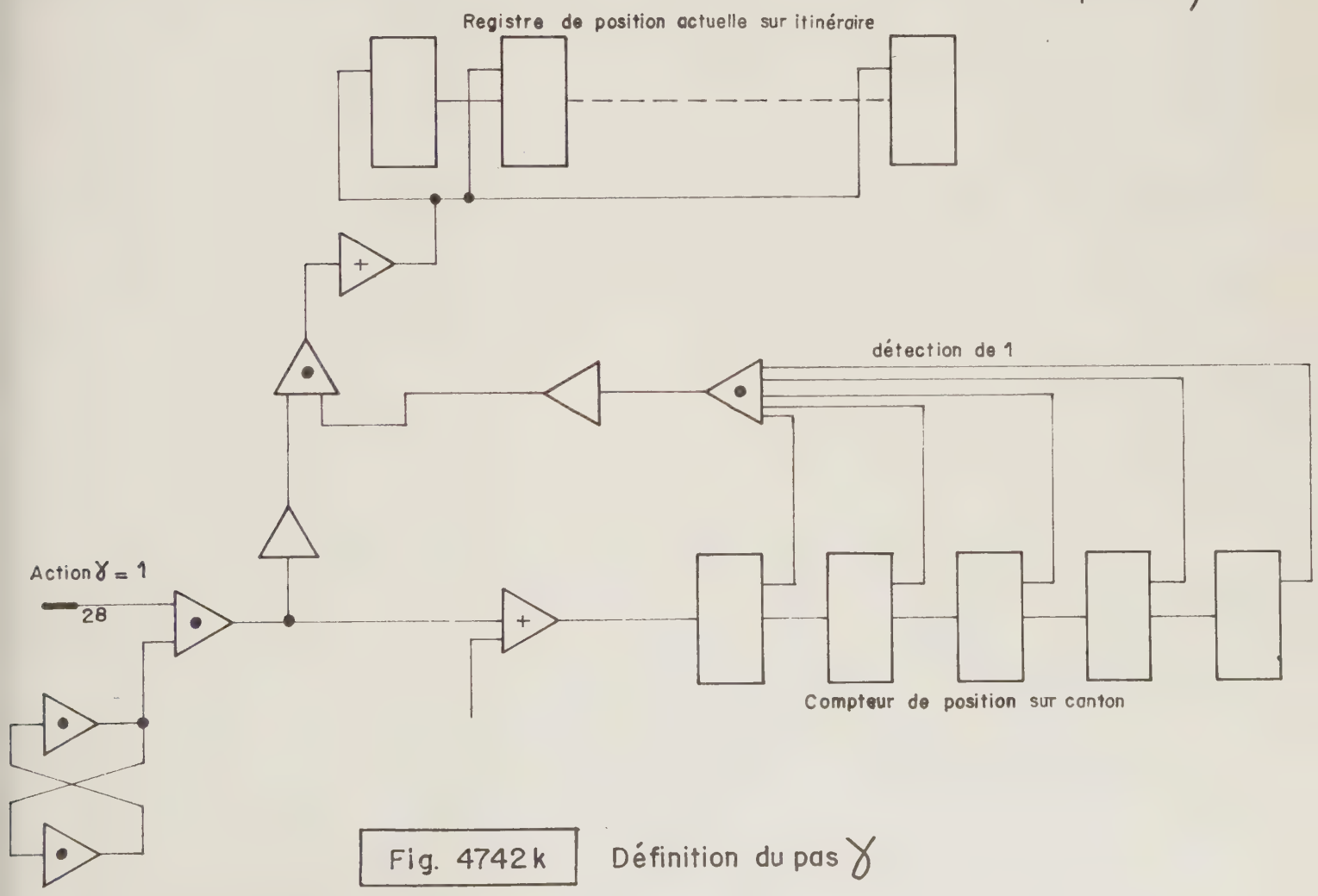



Fig. 4742 k Définition du pas $\gamma$

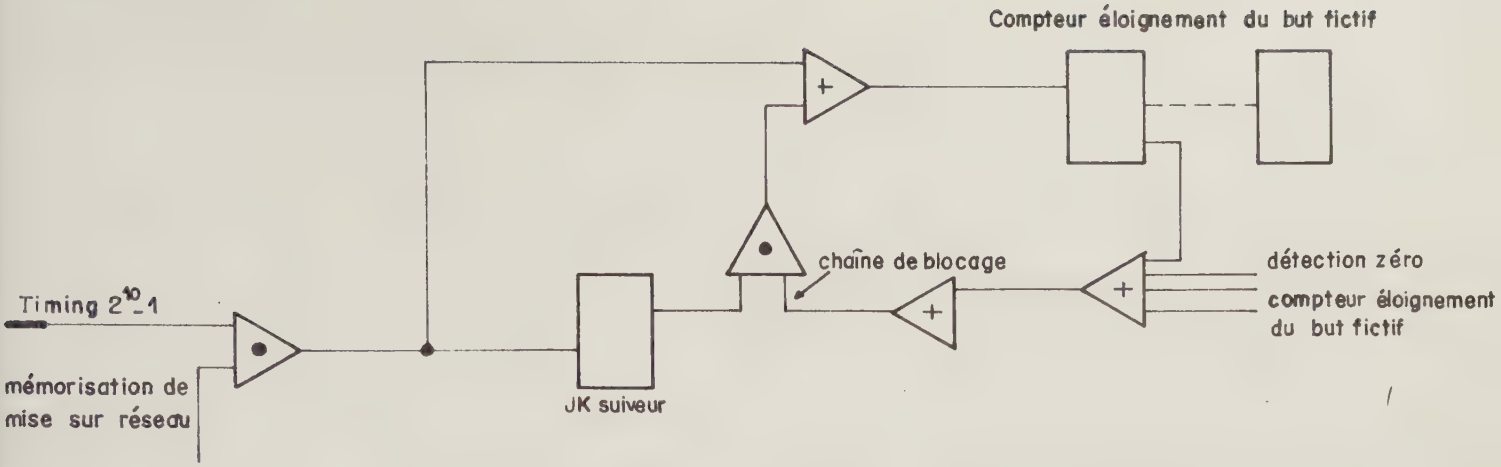



Fig 4742 m

_ Enregistrement par le compteur d'eloignement du but fictif.

_ Dispositif de blocage à la valeur maximum.

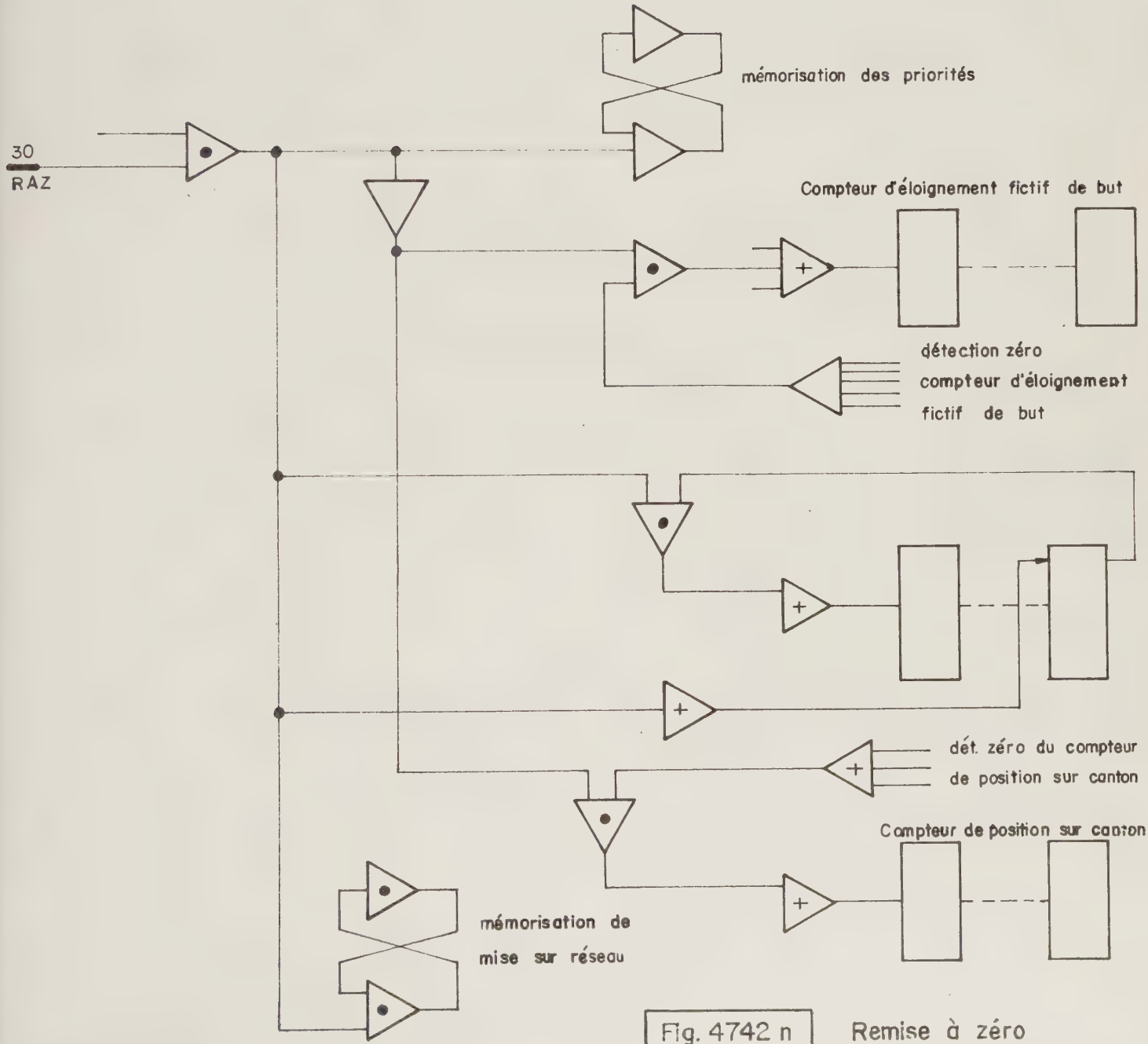



Fig. 4742 n Remise à zéro

71.04.16-2872/RK

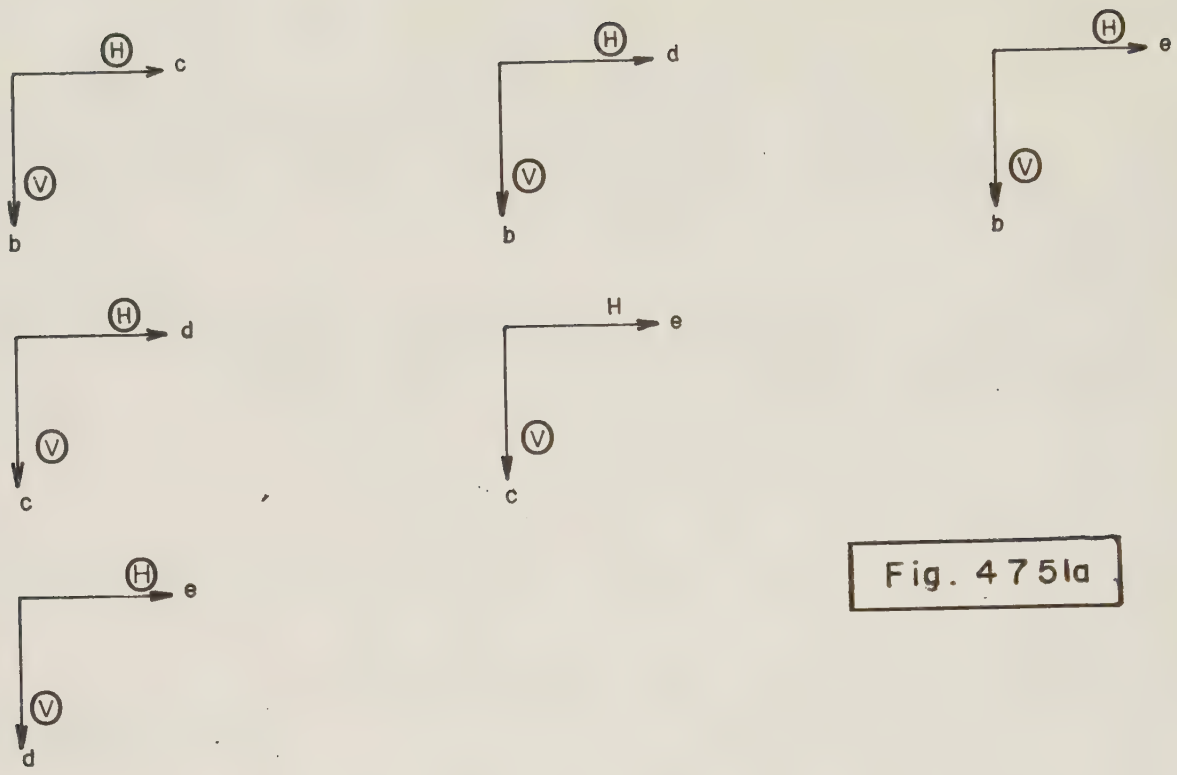



Fig. 4751a

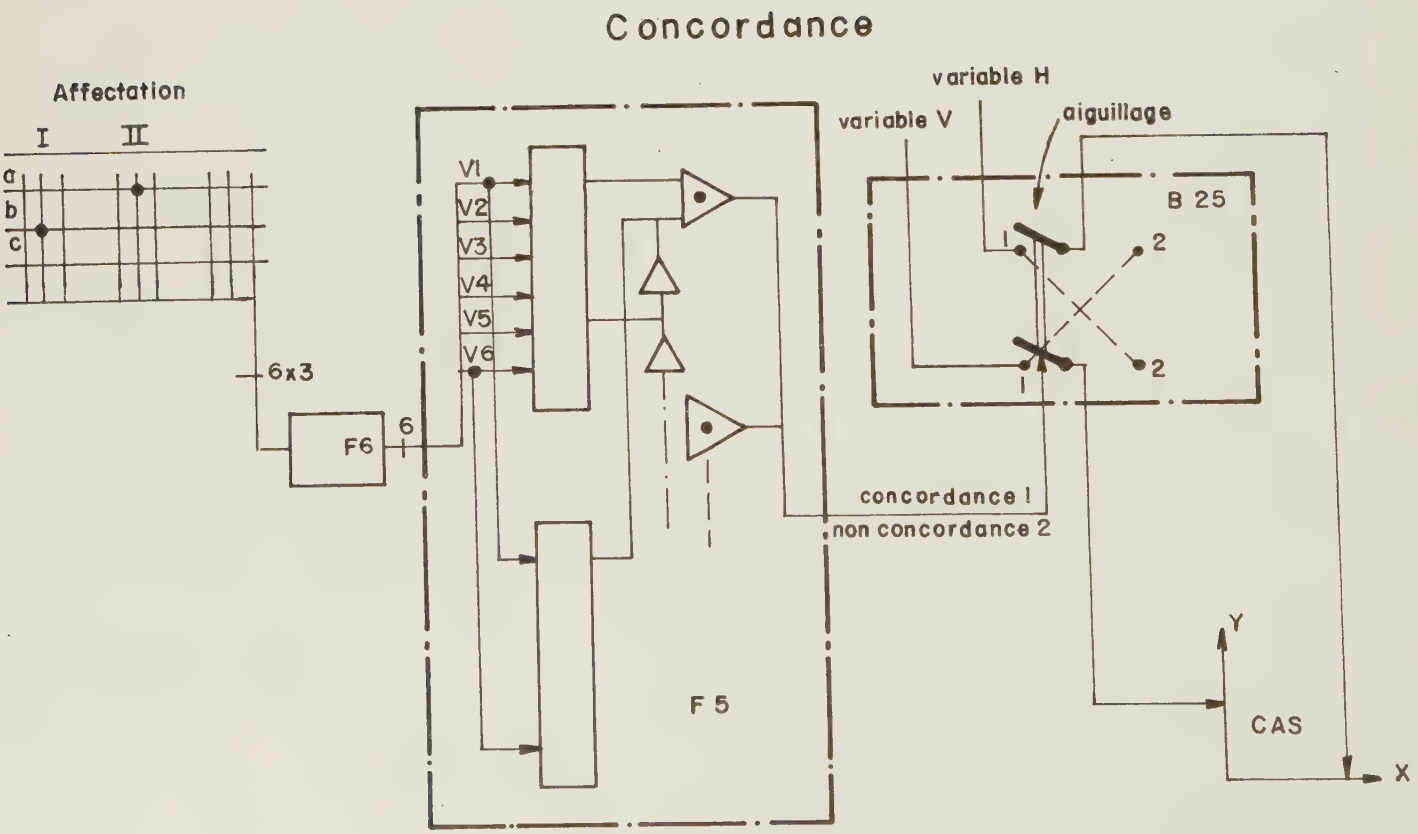



Fig.4751b

# Plaques selection C8 - C11 - C14

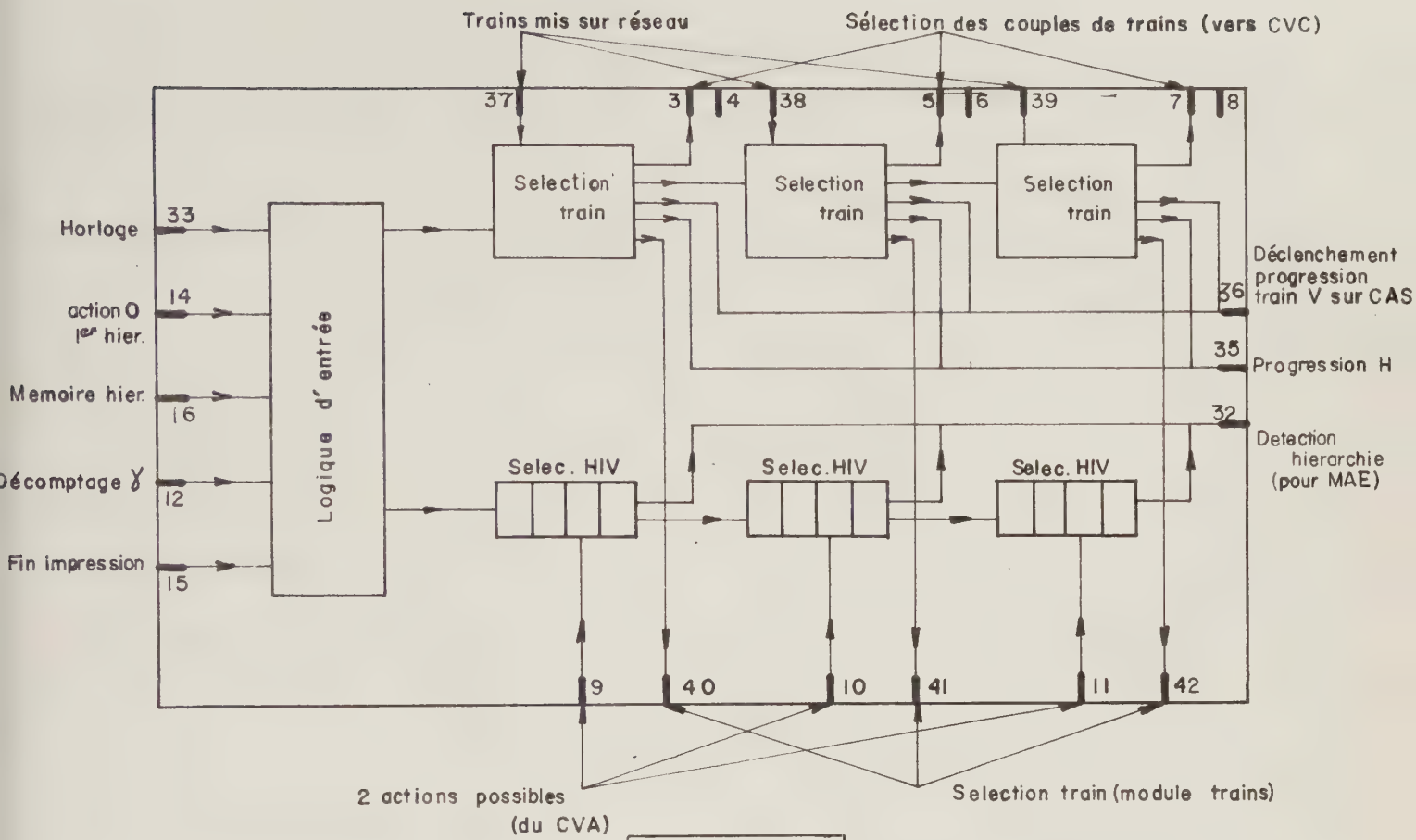



Fig. 475lc

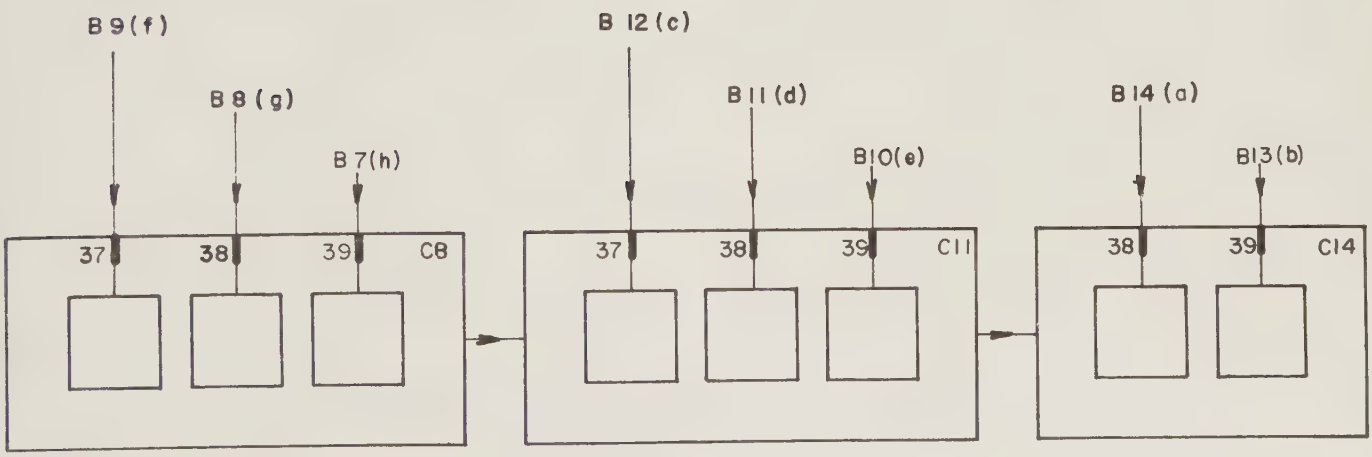



Fig. 475ld

Fig 4752 a — Plaque logique de commande B 16

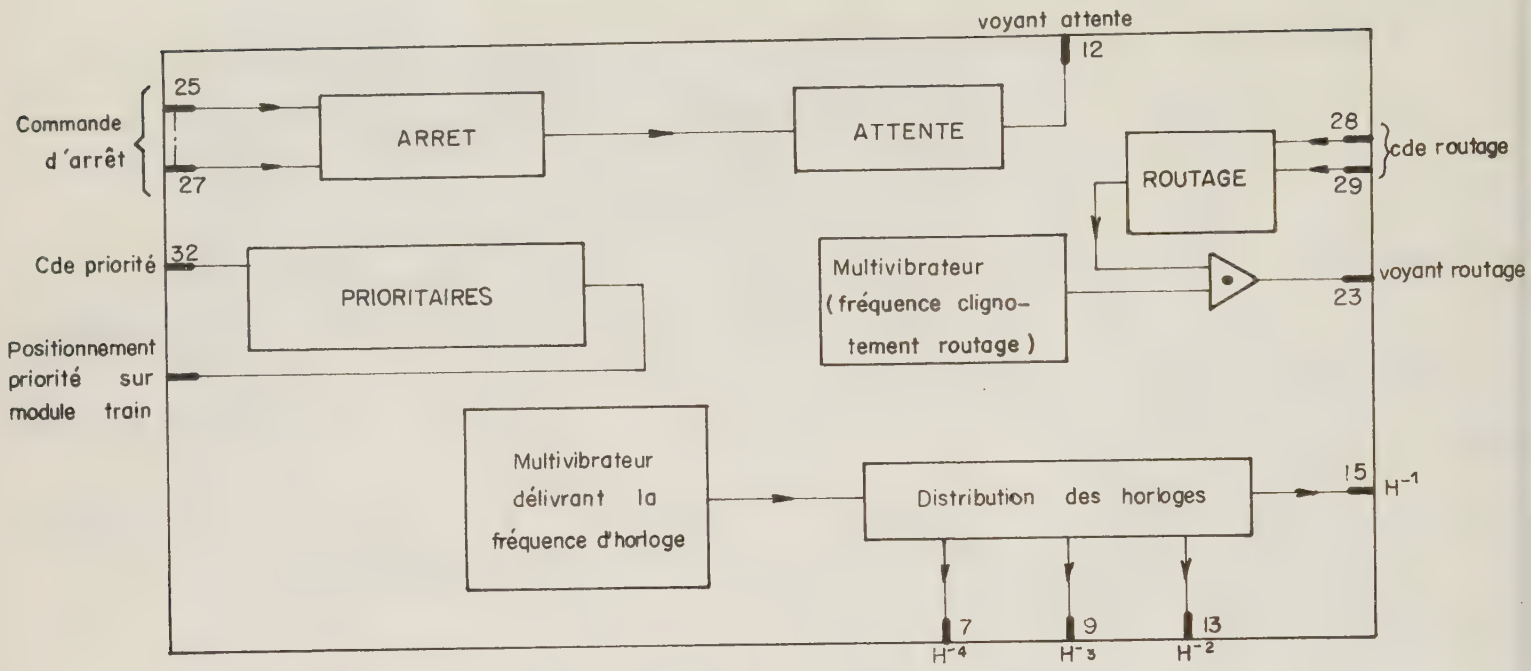



Fig 4752 b — Plaque (Timing + RAZ) B 22

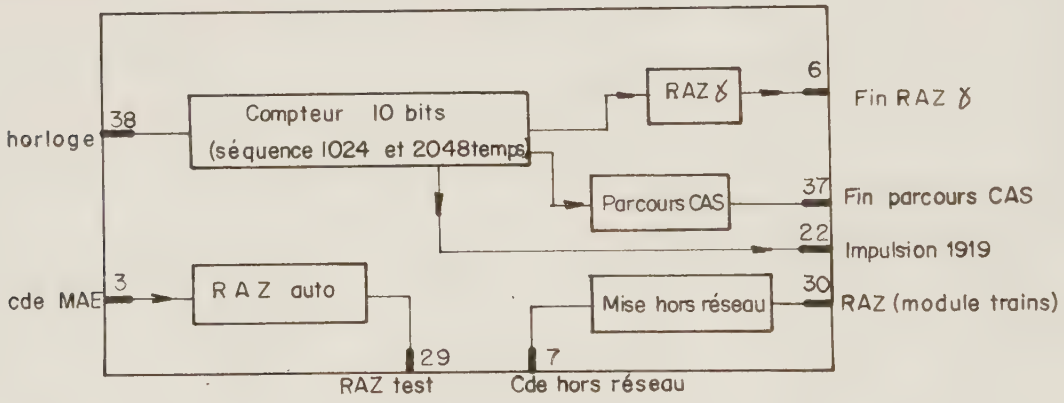



Fig 4752 c — Plaque timing β-B 19

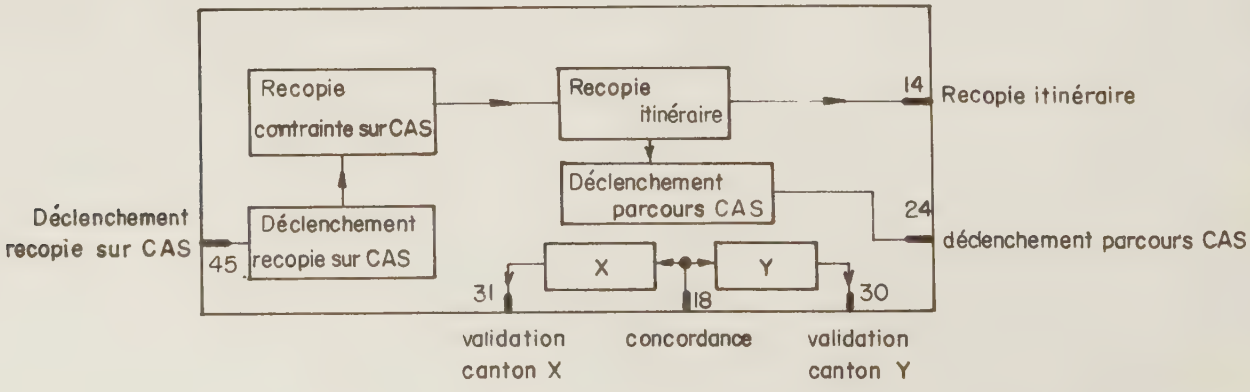


Fig 4752 d — Plaque timing ϑ : C 23

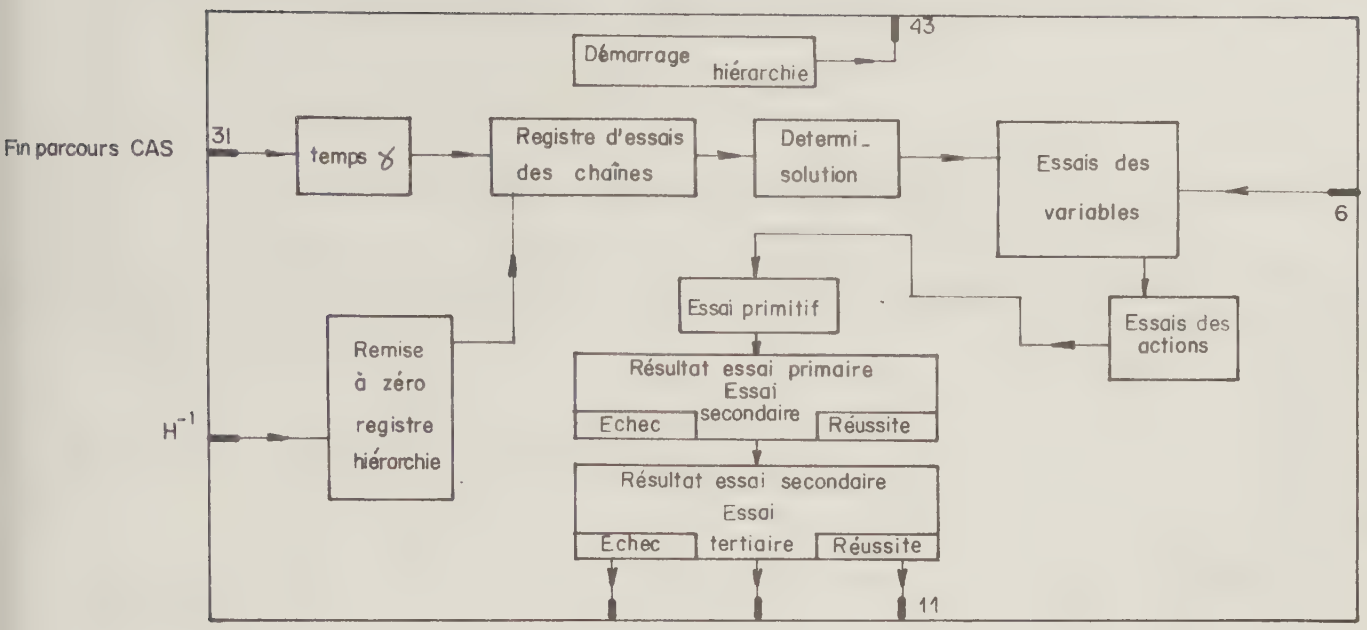



Fig 4752 e

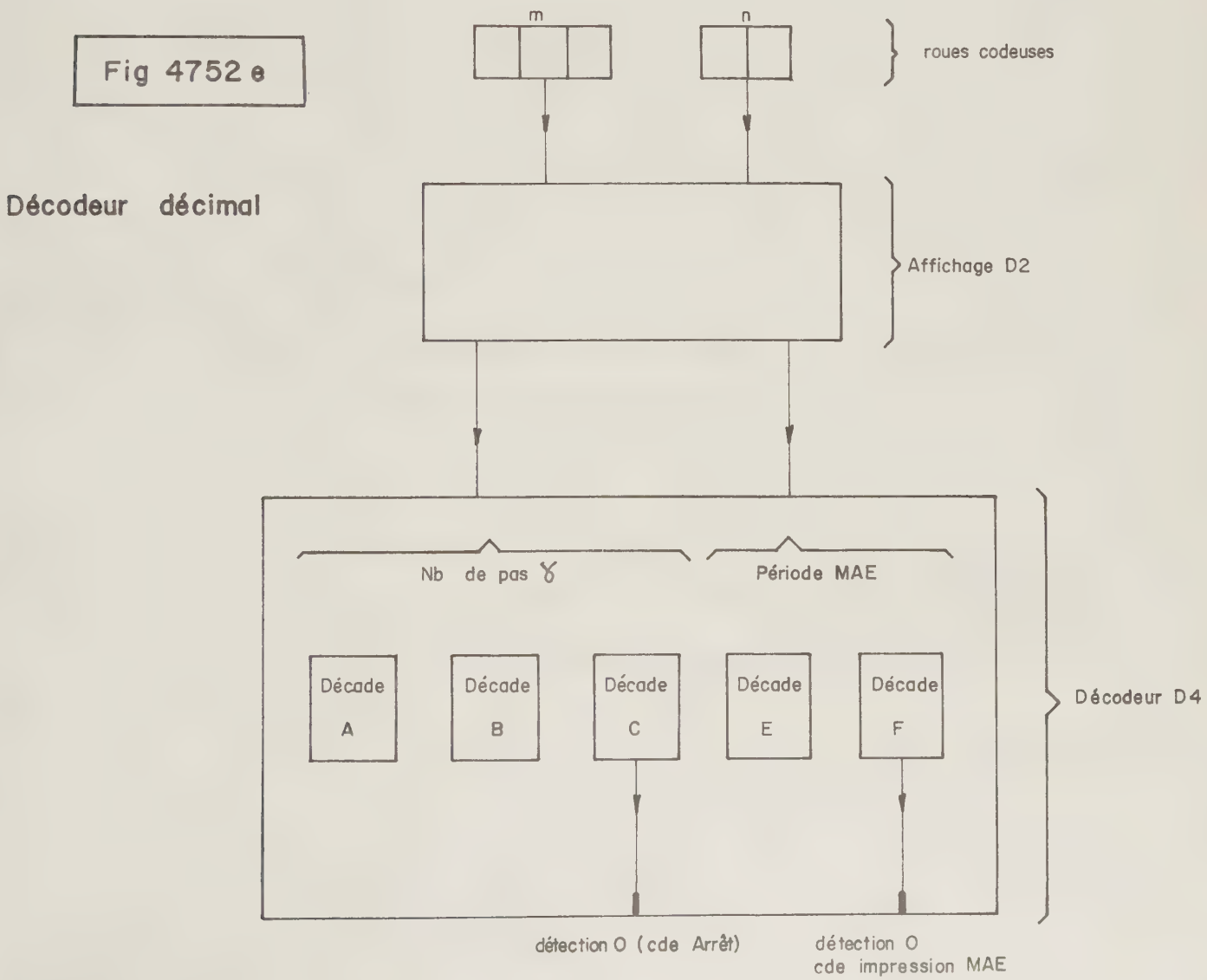
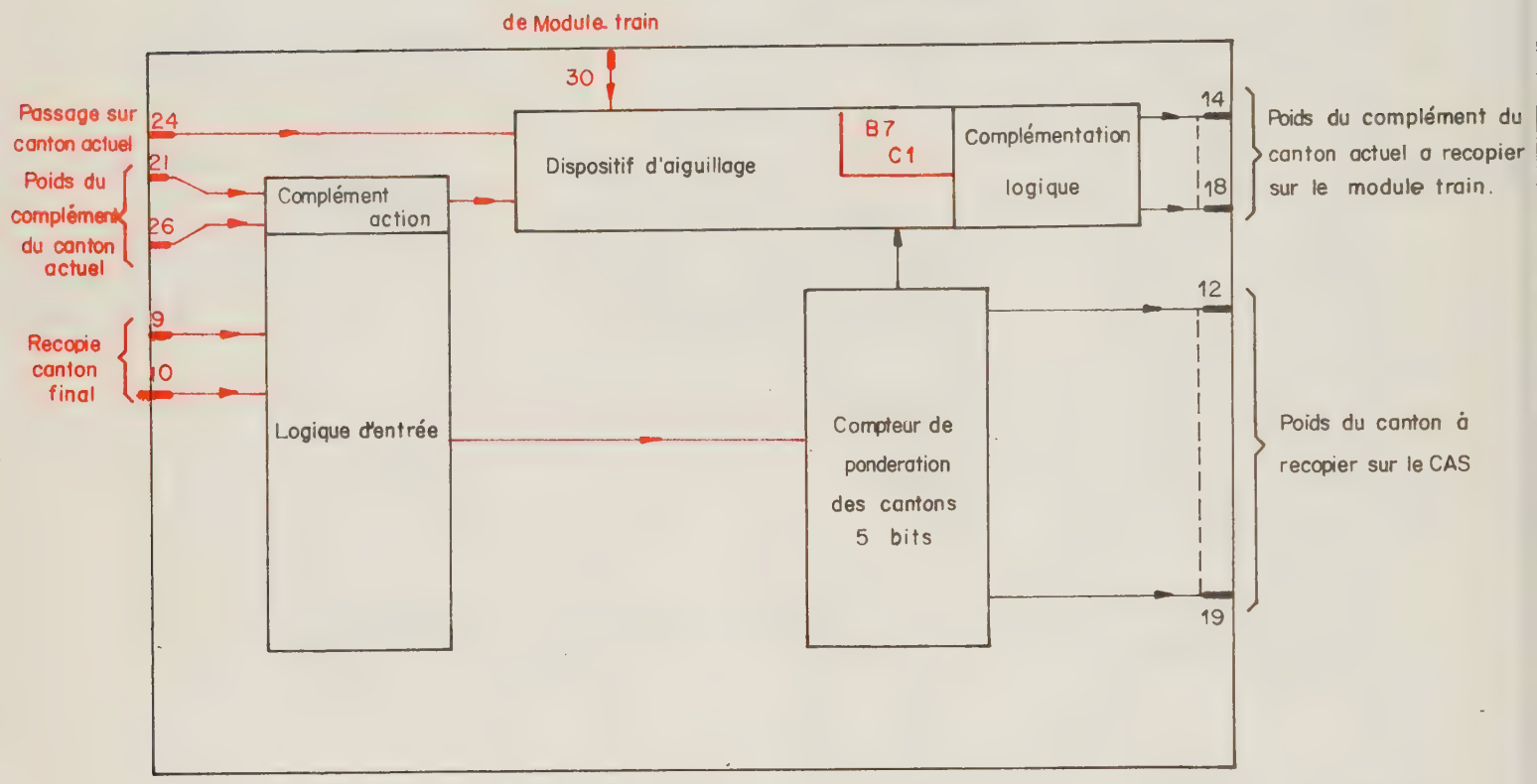


Fig 476_1a

## Plaque d'interface CAS – Matrice pondération – Situation train A 17



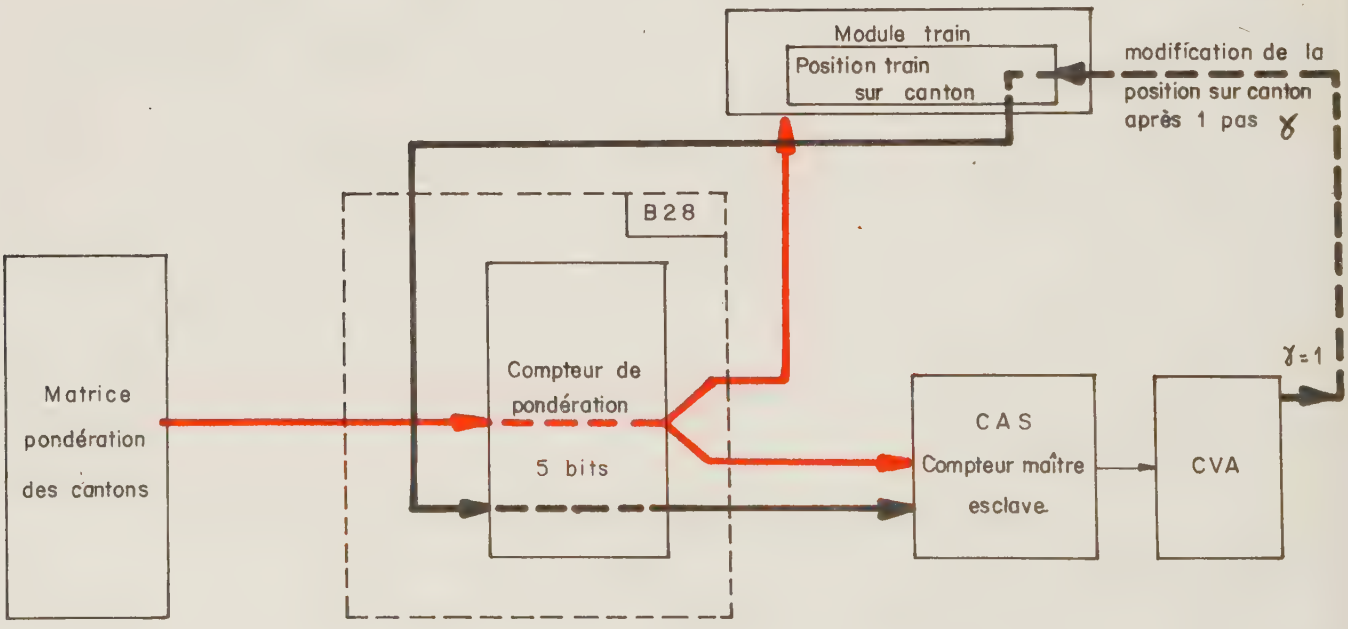




Fig 476-1b

Fig 4762a

Interface CAS _Matrice des contraintes B28

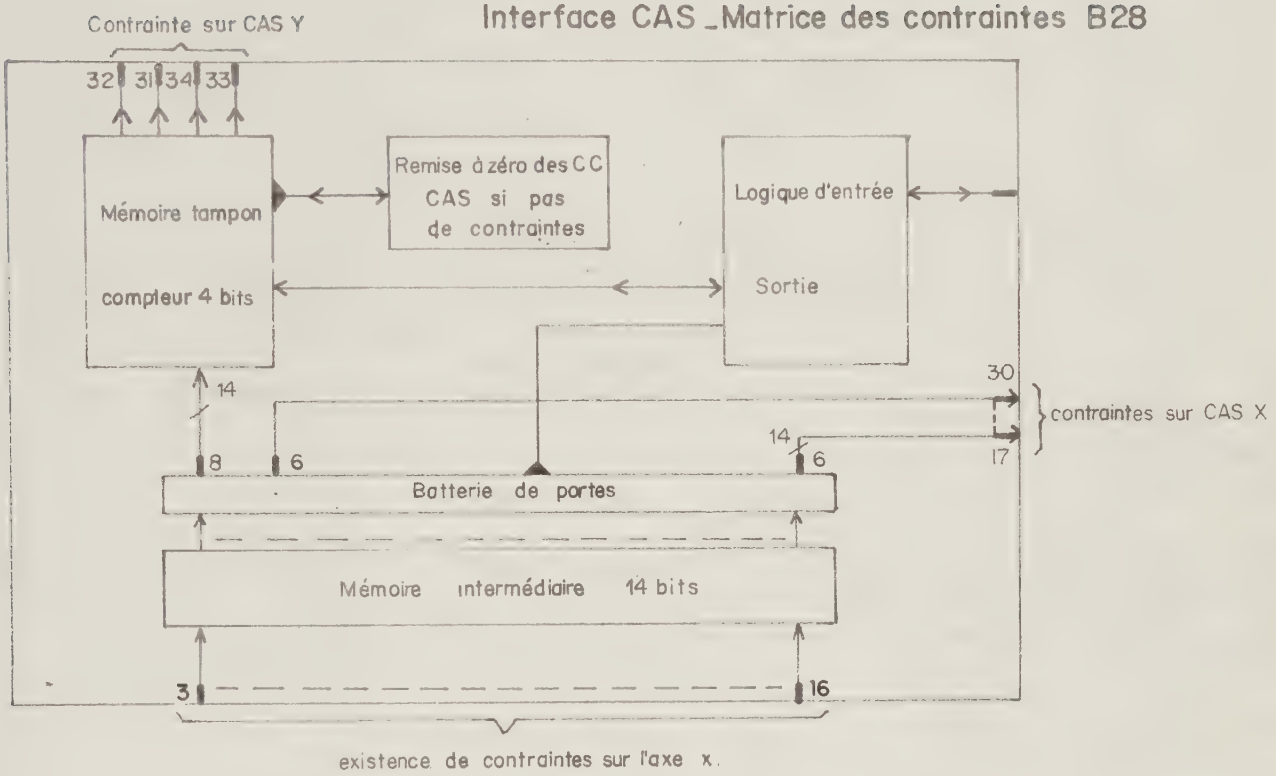



Fig 4762 b

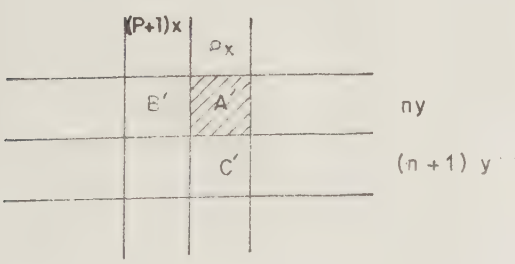
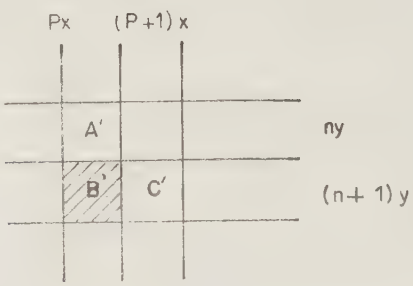



Fig. 4762 c



# REGISTRE DE BALAYAGE DES CANTONS C.A.S. (B 31)

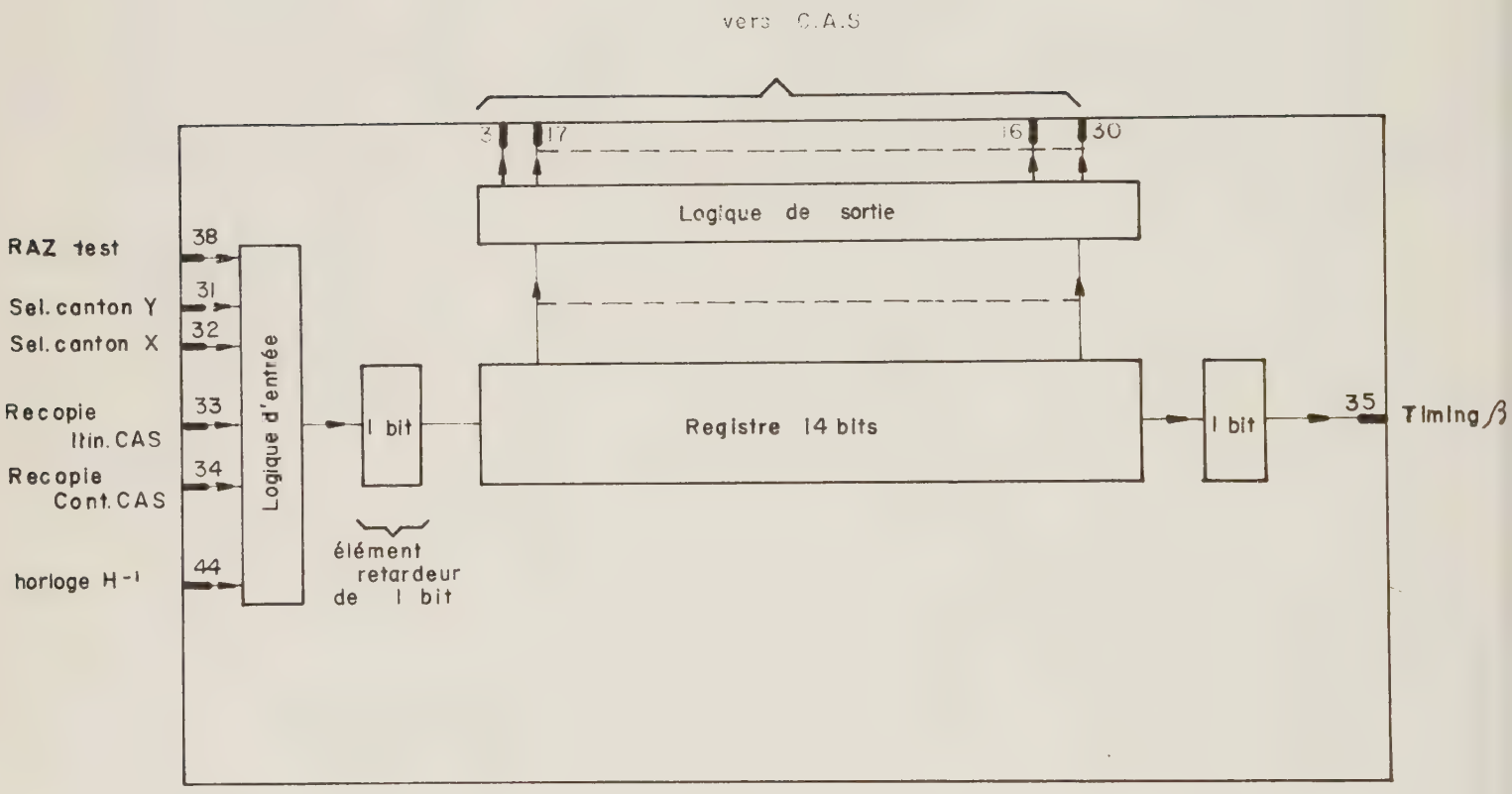
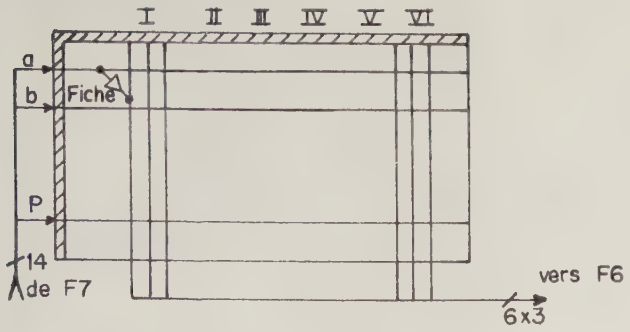
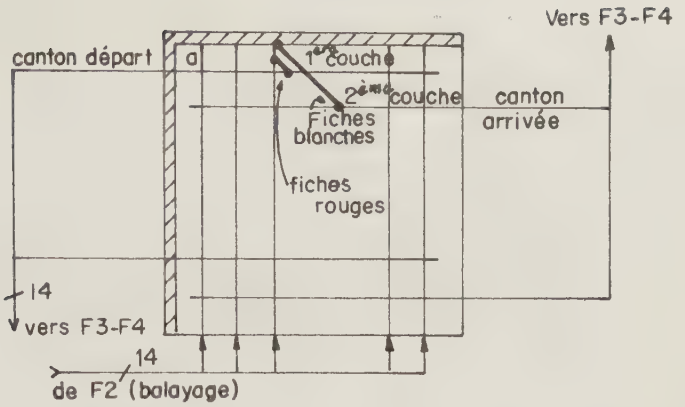


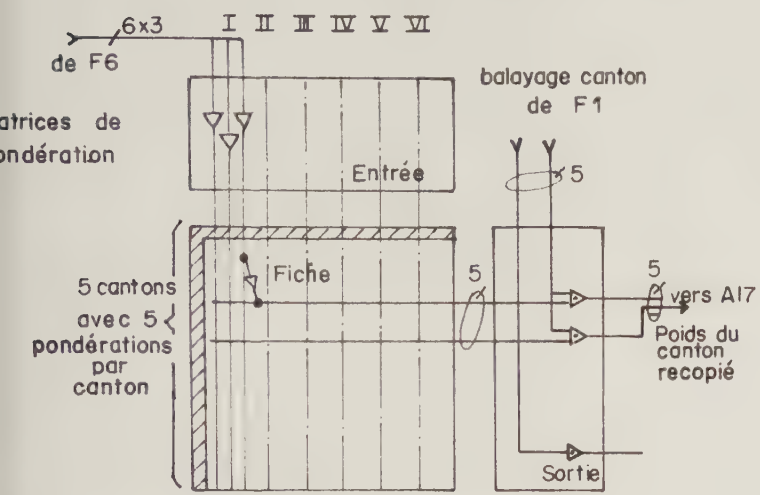

Fig. 4763 a

Matrice d'affectation

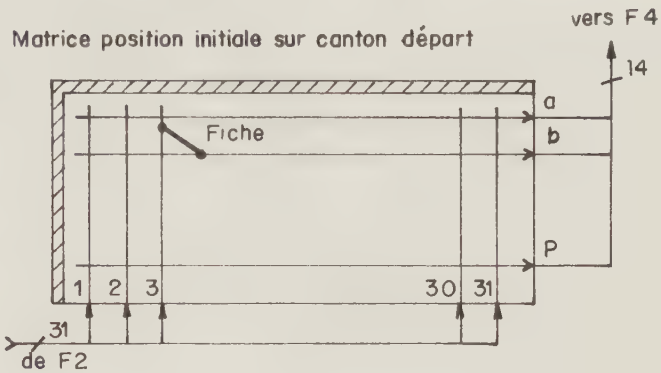


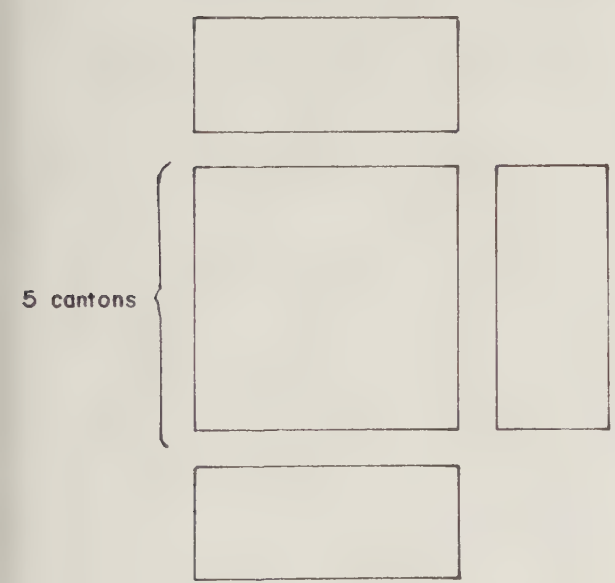

Matrice canton Arrivée _ Canton départ

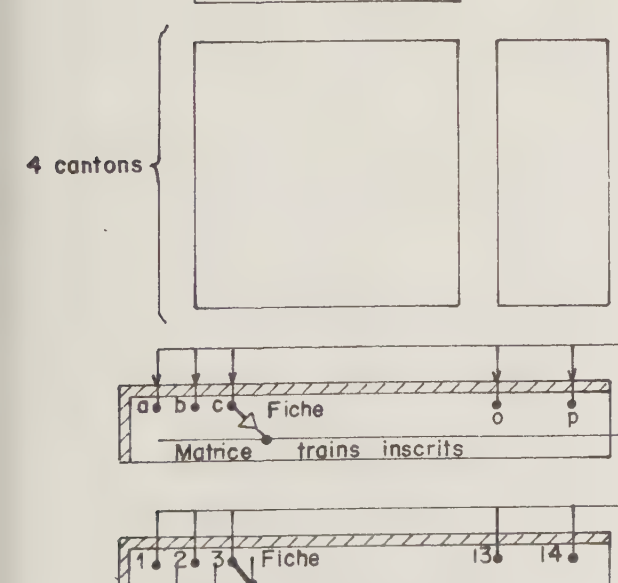


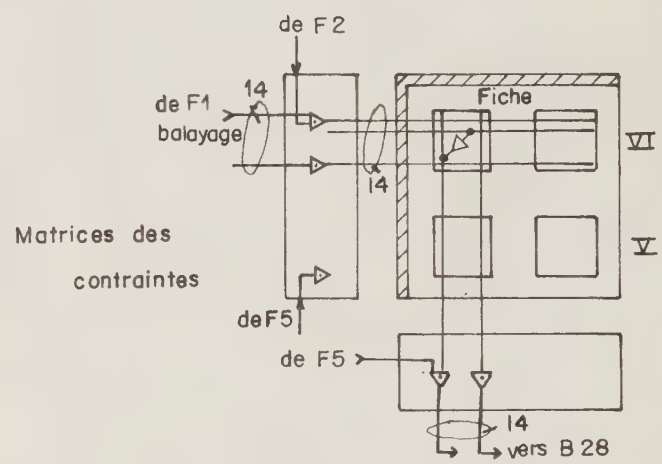



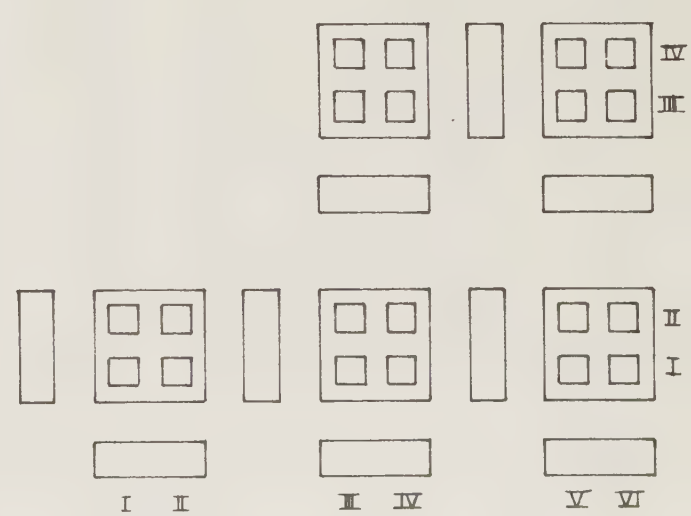

Matrice position initiale sur canton départ

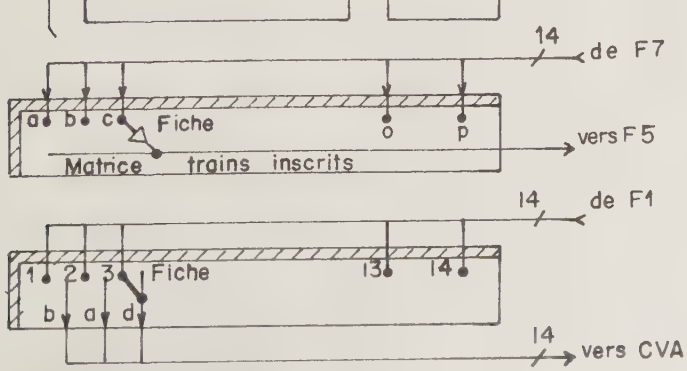


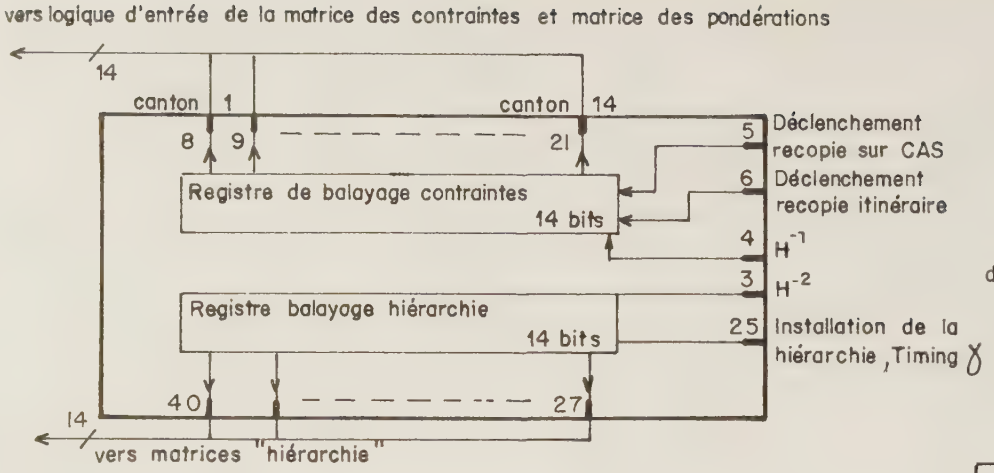




Matrice affichage hiérarchie intervariables (HIV)

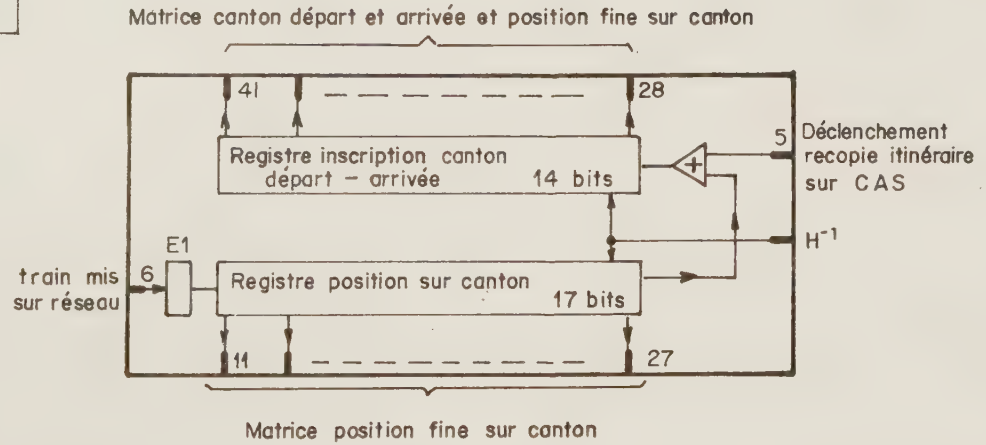
Fig. 48a

71.04.19/2899/RK

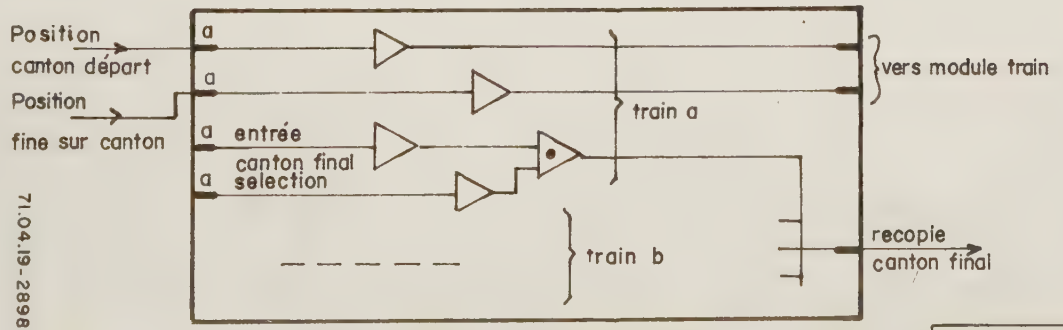
F 1




F 2

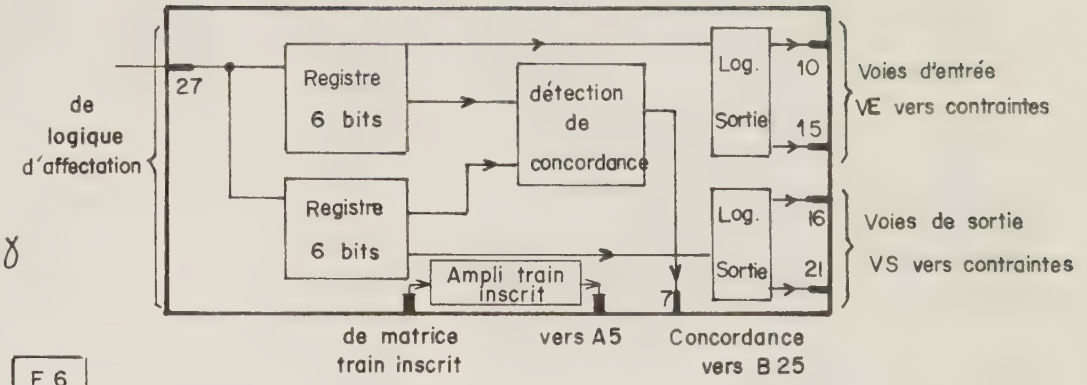



F3 / F4

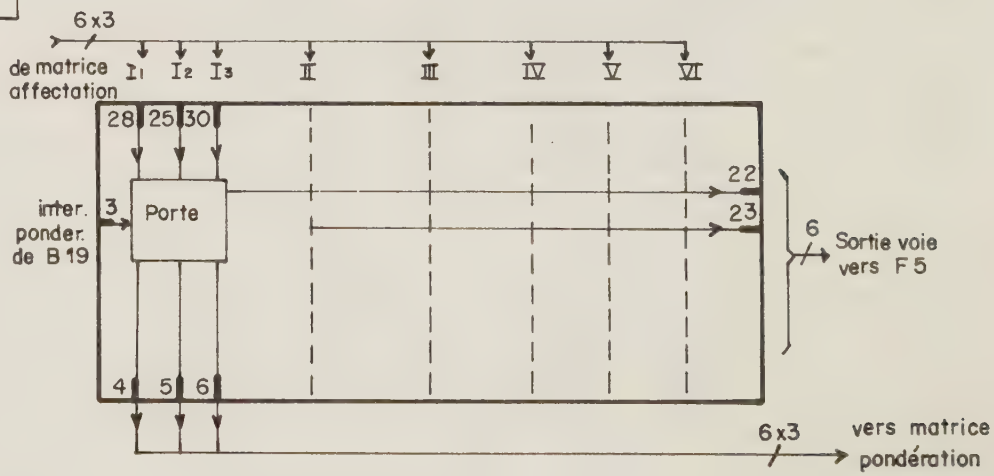



71.04.19-2898/RK

F5




F 6




F 7

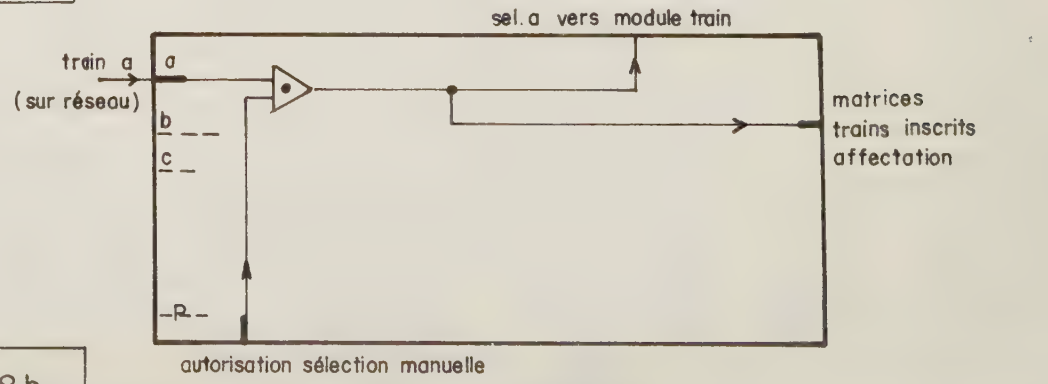



Fig. 48 b

Matrice configuration des voies

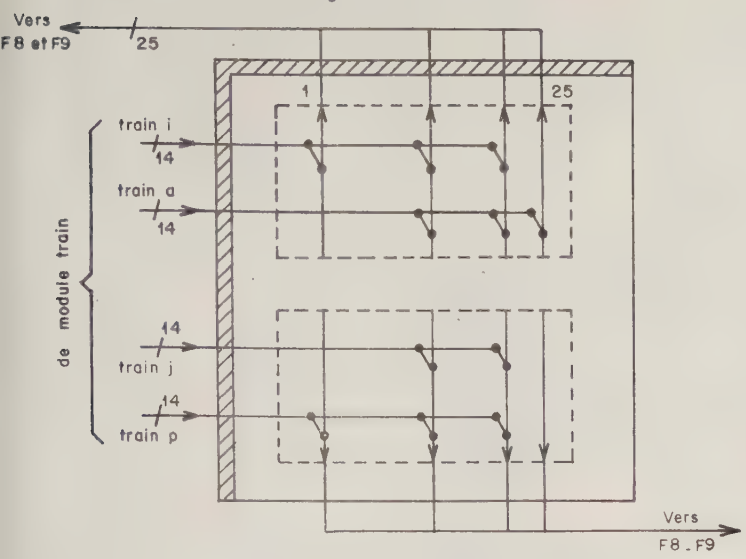



Figure 49a

Amplification des voyants A8 . A11

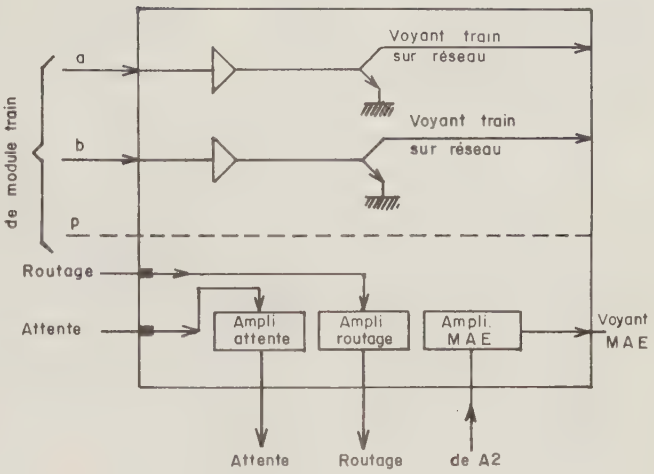



Figure 49b

Logique de sortie de la matrice configuration des voies F8 . F9

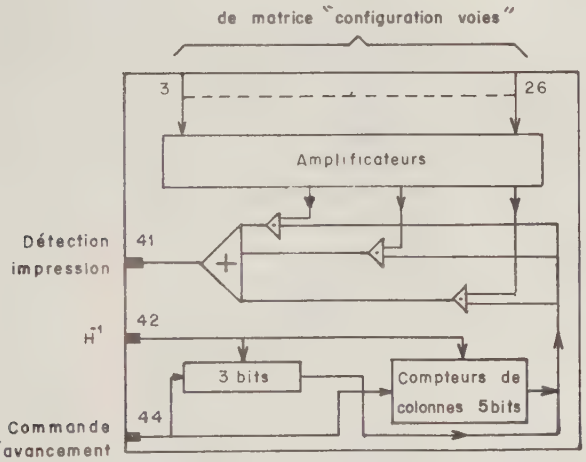



Figure 49c

Commande des électro-aimants de la MAE (A5)

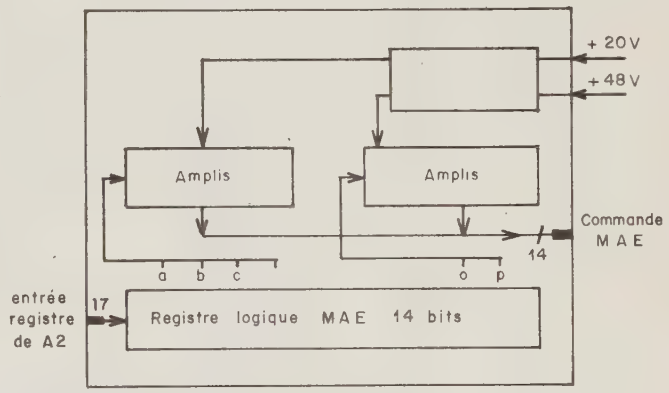



Figure 49d

Logique de commande MAE (A2)

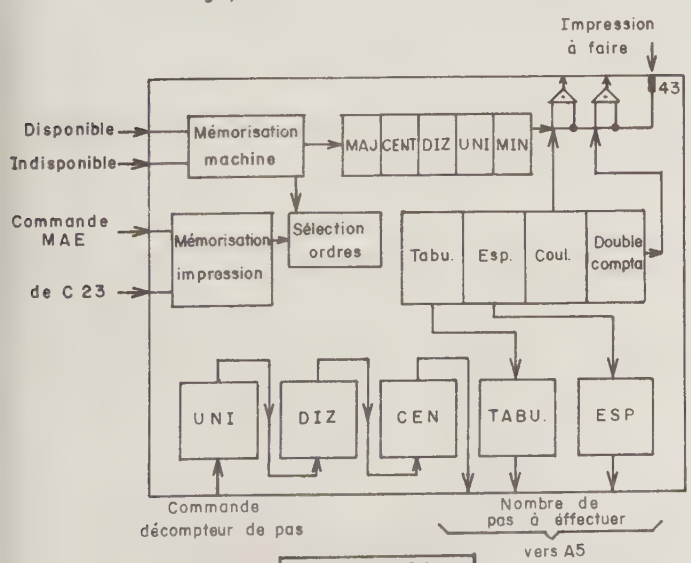



Figure 49e

Alimentations

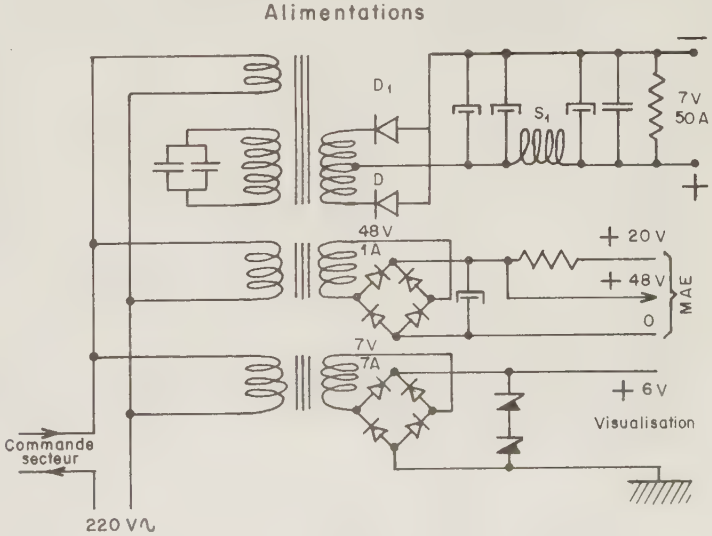
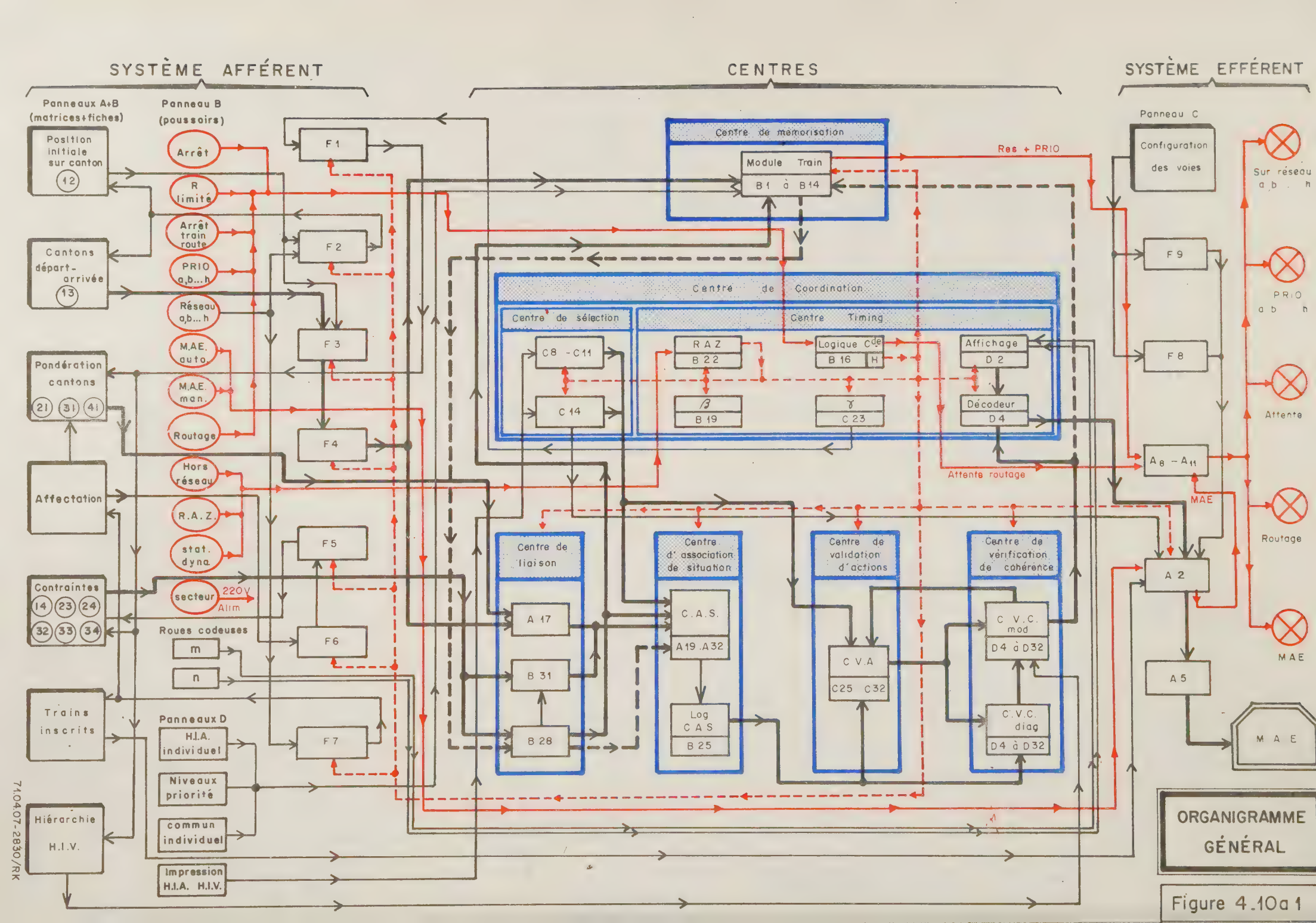



Figure 49f

71.03.23-2745/RK


SYSTÈME AFFÉRENT
CENTRES
SYSTÈME EFFÉRENT
Panneaux A+B (matrices+fiches)
Panneau B (poussoirs)
Position initiale sur canton 12
Cantons départ-arrivée 13
Pondération cantons 21 31 41
Affectation
Contraintes 14 23 24 32 33 34
Trains inscrits
Hiérarchie H.I.V.
Arrêt
R limité
Arrêt train route
PRIO a,b...h
Réseau a,b...h
M.A.E. auto.
M.A.E. man.
Routage
Hors réseau
R.A.Z.
stat. dyna.
secteur 220V Alim
Roues codeuses
m
n
Panneaux D
H.I.A. individuel
Niveaux priorité
commun individuel
Impression H.I.A. H.I.V.
F1
F2
F3
F4
F5
F6
F7
Centre de mémorisation
Module Train
B1 à B14
Res + PRIO
Centre de Coordination
Centre de sélection
C8 - C11
C14
Centre Timing
RAZ B22
β B19
Logique Cde B16 H
γ C23
Affichage D2
Décodeur D4
Attente routage
Centre de liaison
A17
B31
B28
Centre d'association de situation
C.A.S.
A19 .A32
Log CAS B25
Centre de validation d'actions
CVA C25 C32
Centre de vérification de cohérence
C V.C. mod D4 à D32
C.V.C. diag D4 à D32
Panneau C
Configuration des voies
F9
F8
A8 - A11
A2
A5
MAE
Sur réseau a b h
PRIO a b h
Attente
Routage
MAE
MAE
71.04.07-2830/RK
ORGANIGRAMME GÉNÉRAL
Figure 4.10a 1

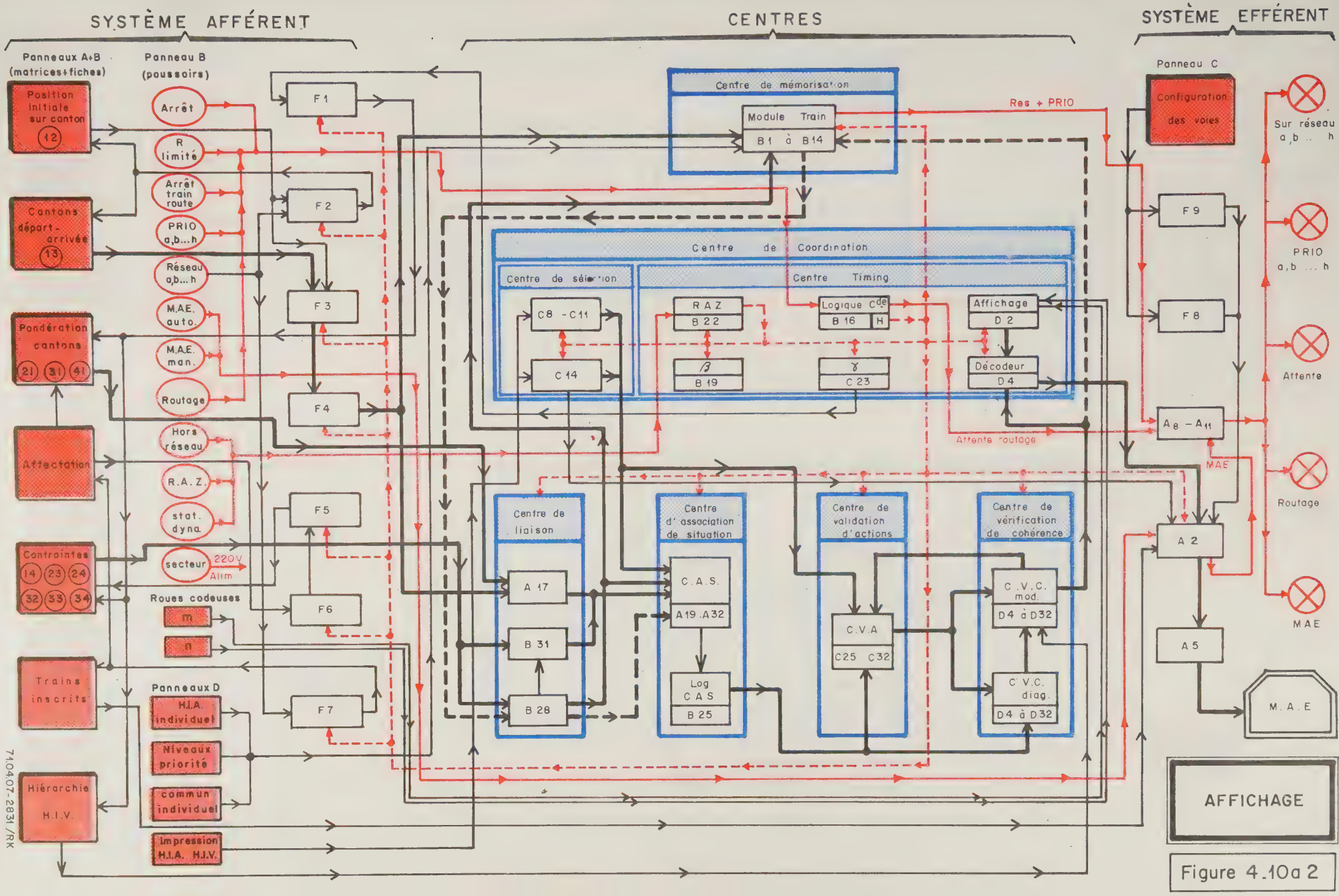



Figure 4.10a 2

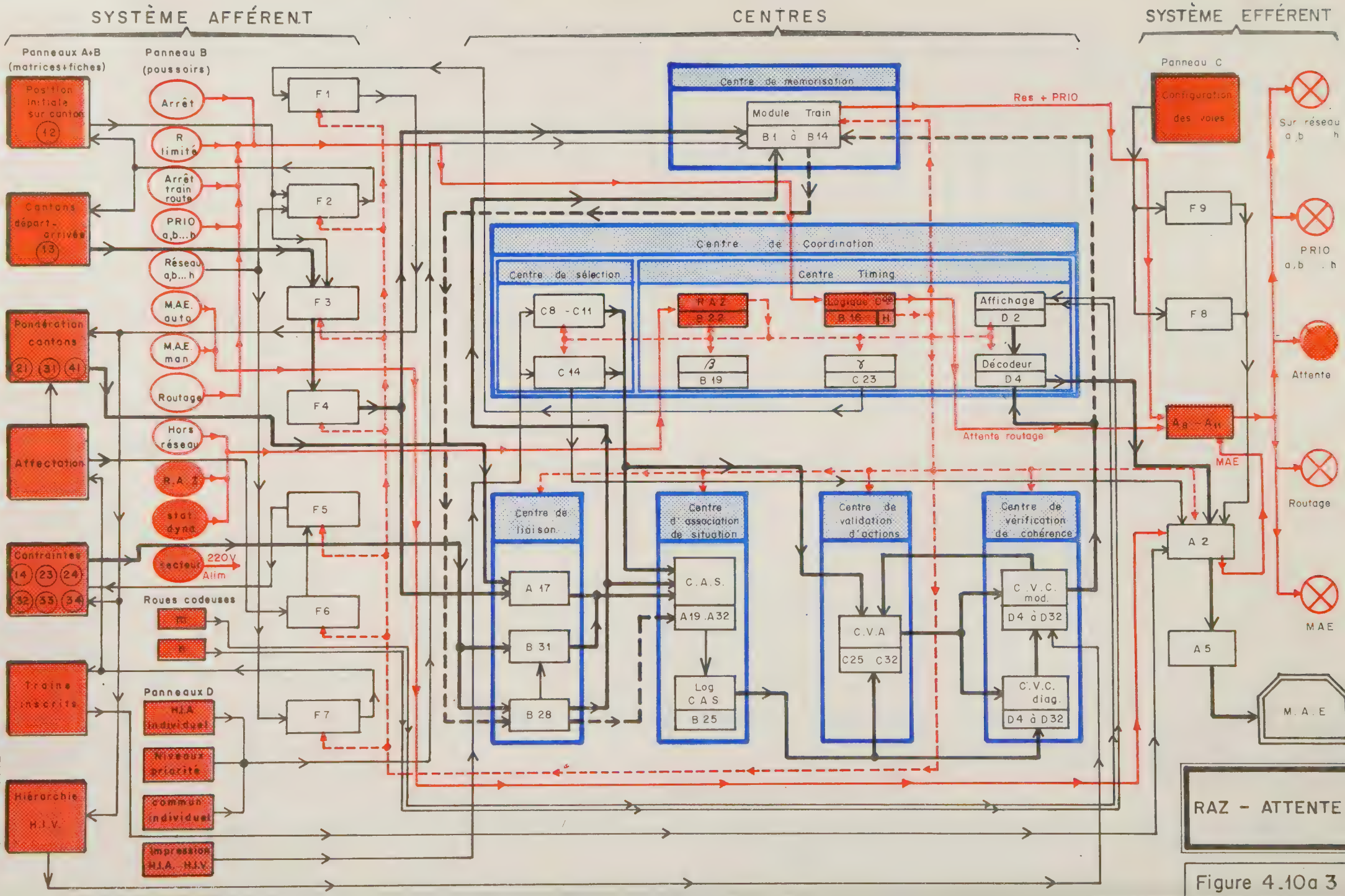



Figure 4.10a 3

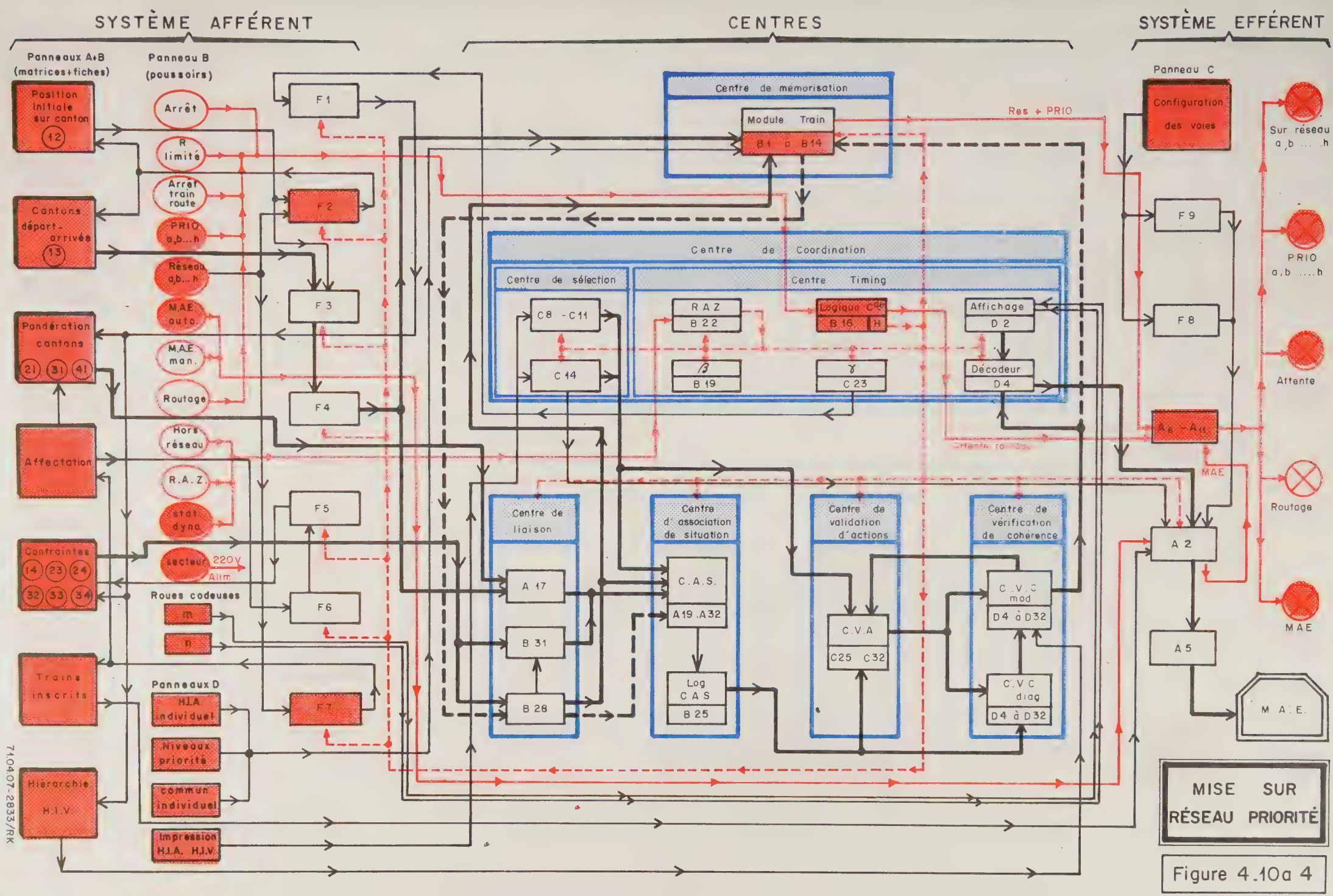



Figure 4.10a 4

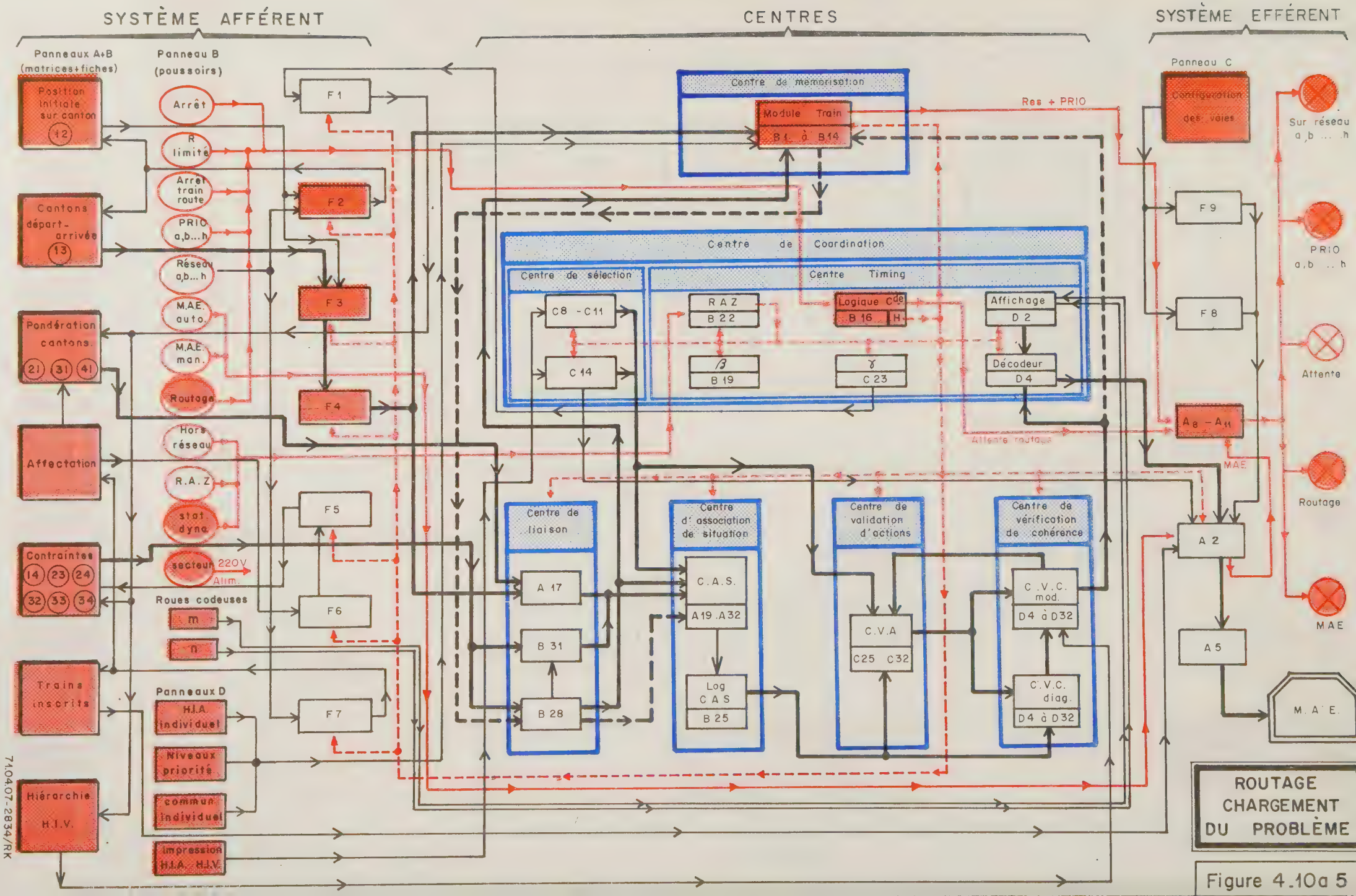



Figure 4.10a 5

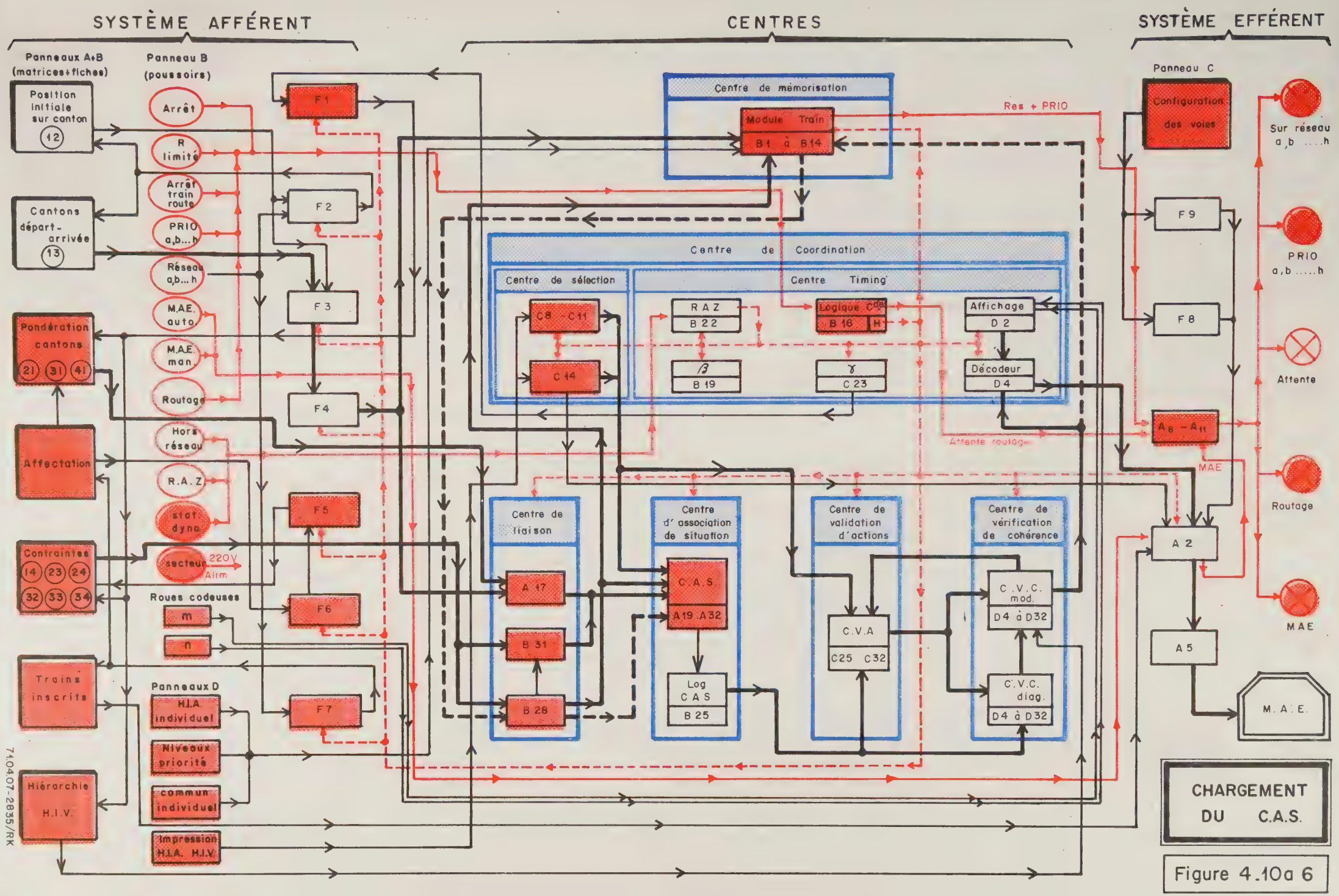



Figure 4.10a 6

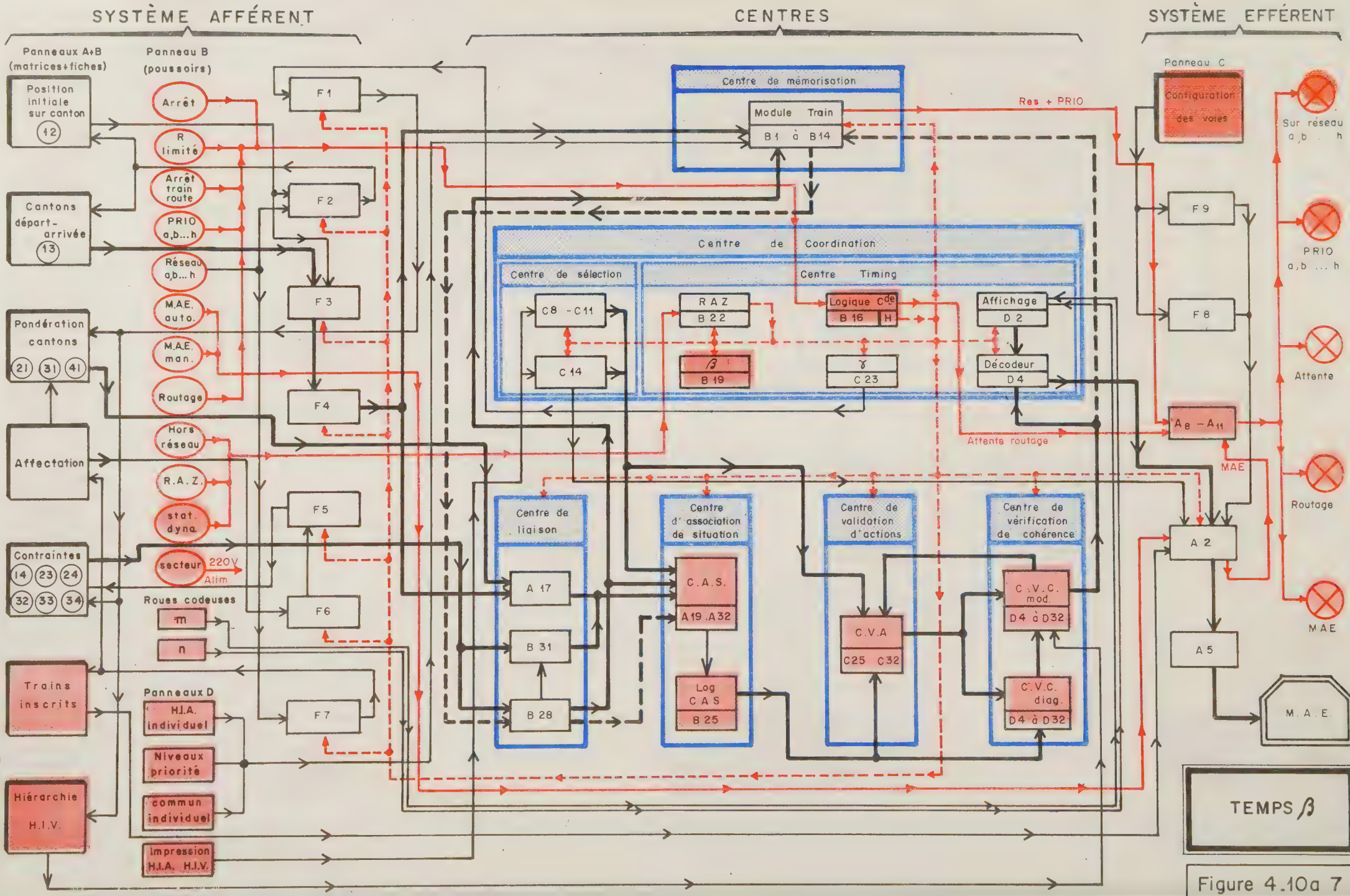



Figure 4.10a 7

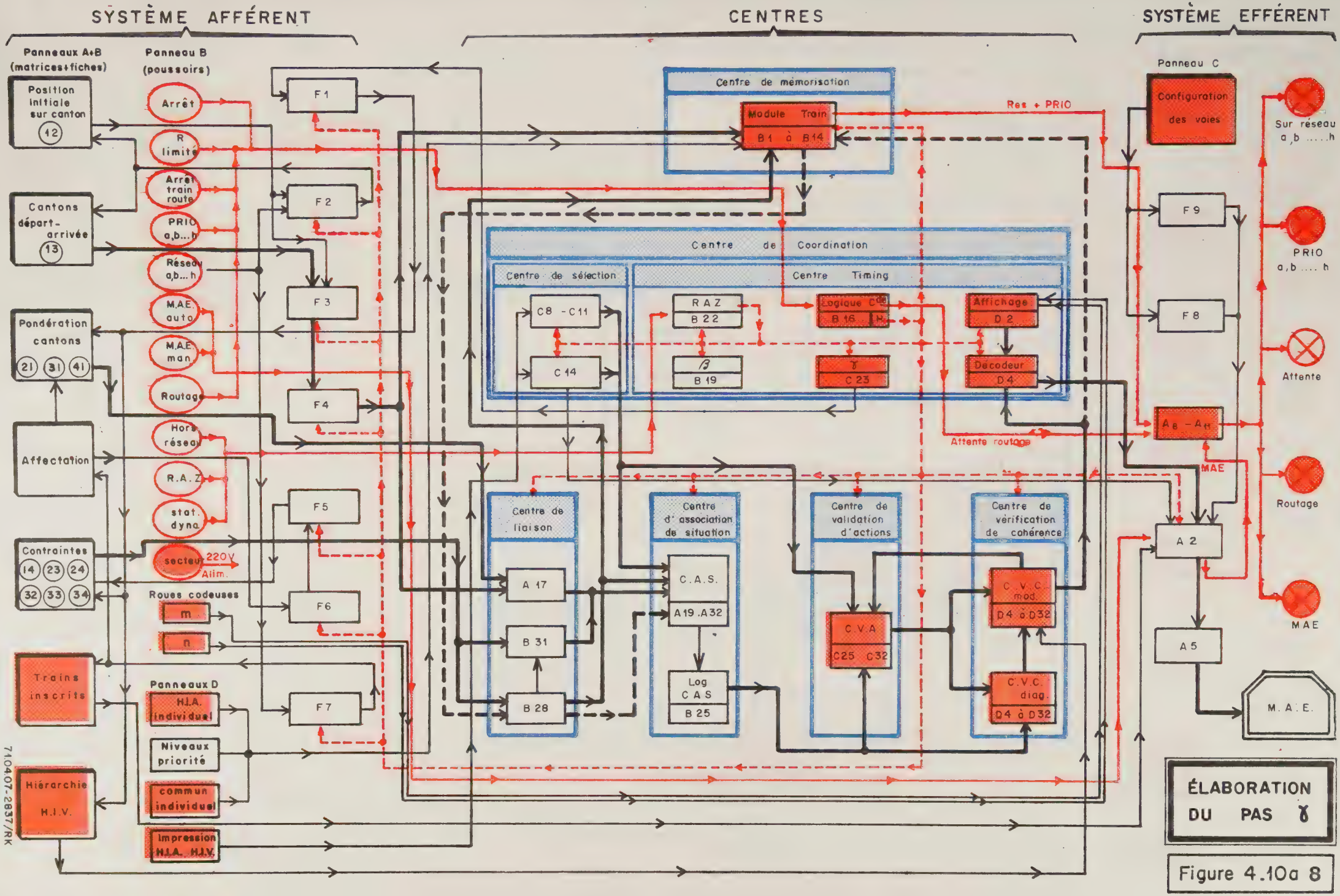



Figure 4.10a 8

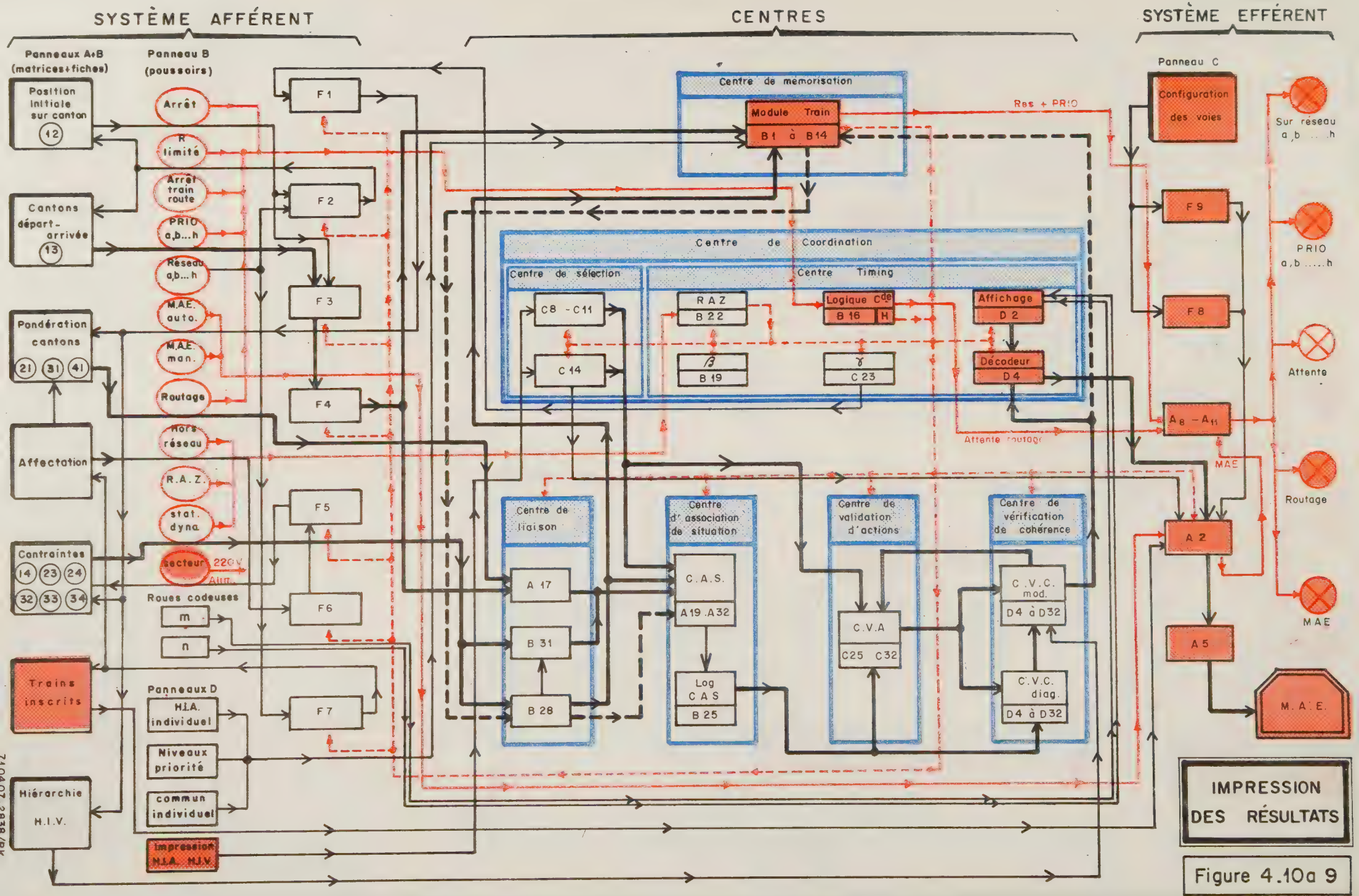



Figure 4.10a 9

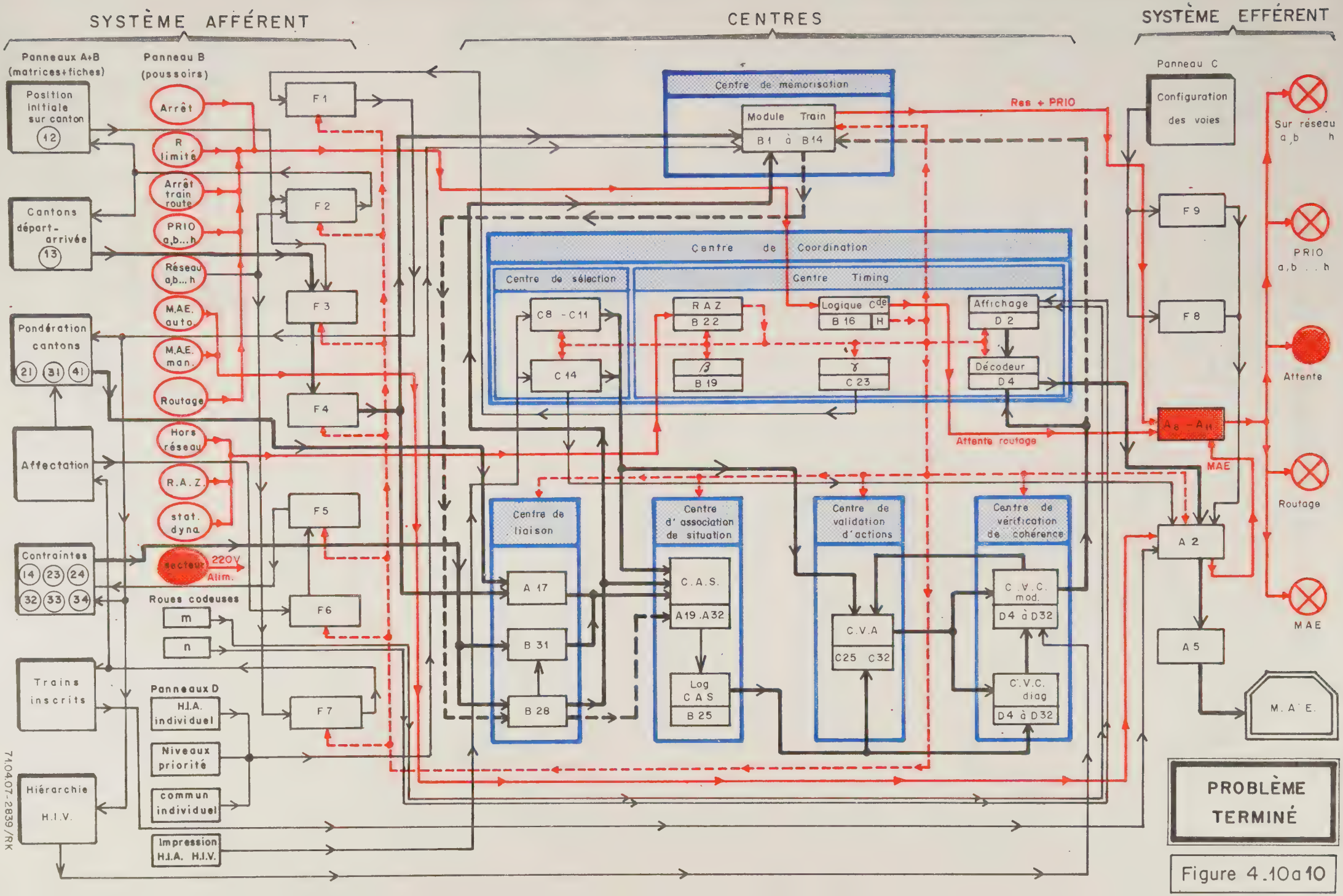



Figure 4.10a10

## CHARGEMENT DES CONTRAINTES DE L'AXE Y

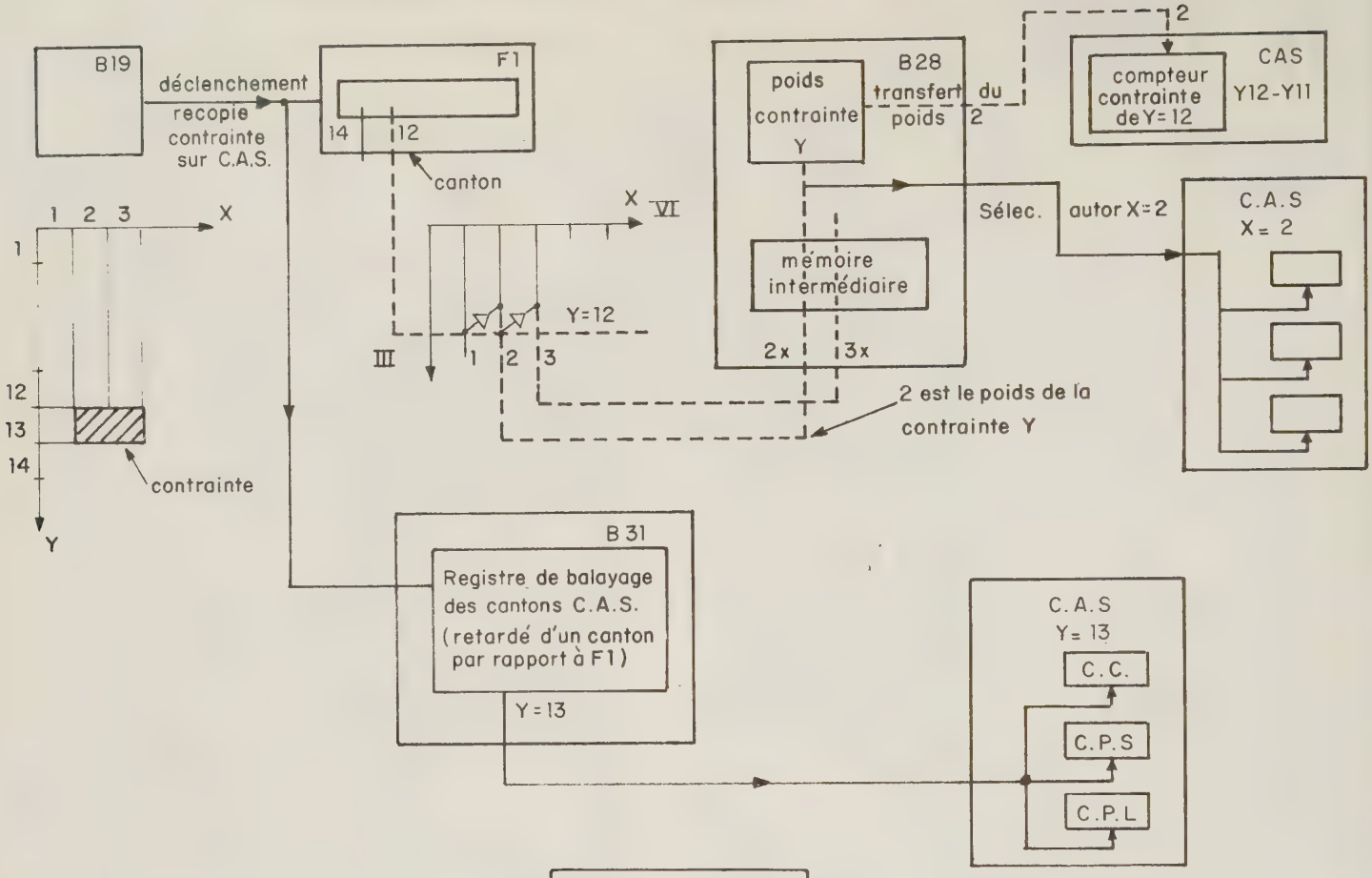



Figure 4.10 b

## REMISE À 1 DU C.A.S. ( maître, esclave, contrainte Y )

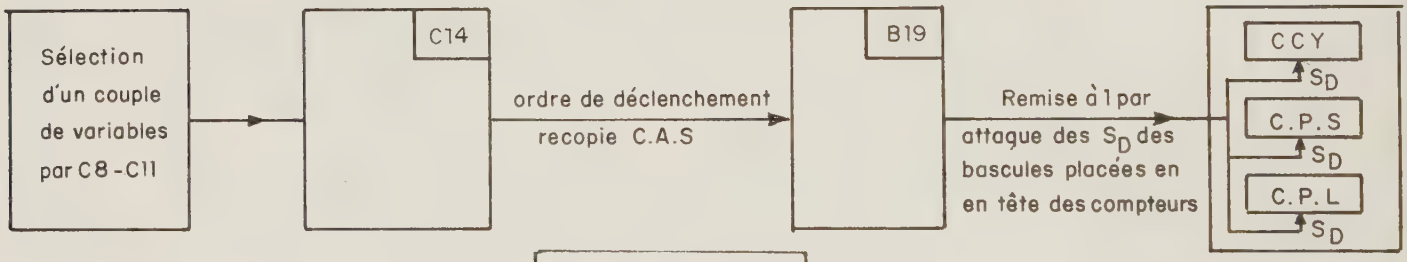



Figure 4.10 c

## ORGANIGRAMME TEMPOREL $\beta$

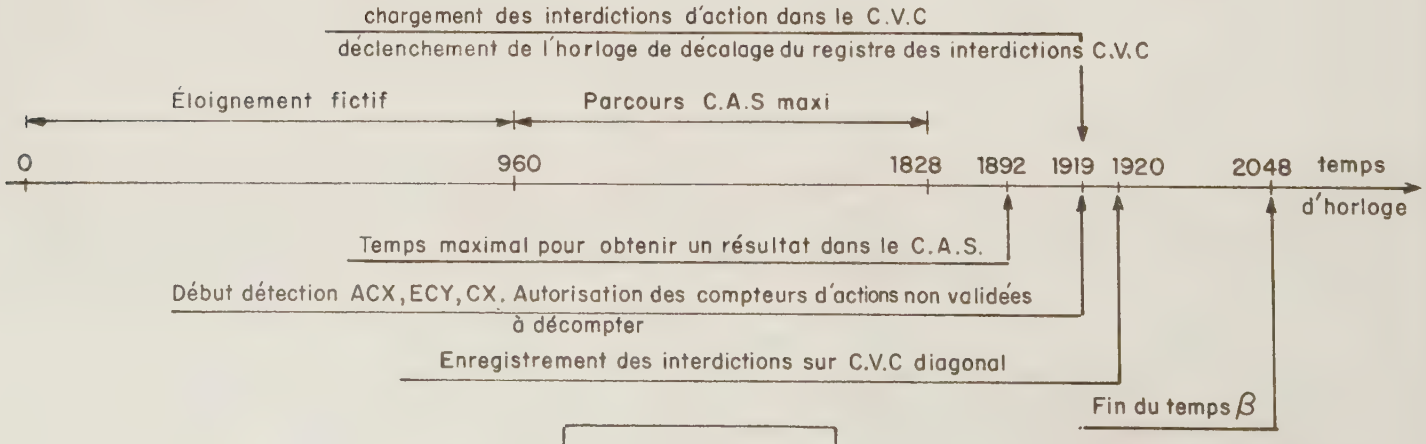



Figure 4.10 d

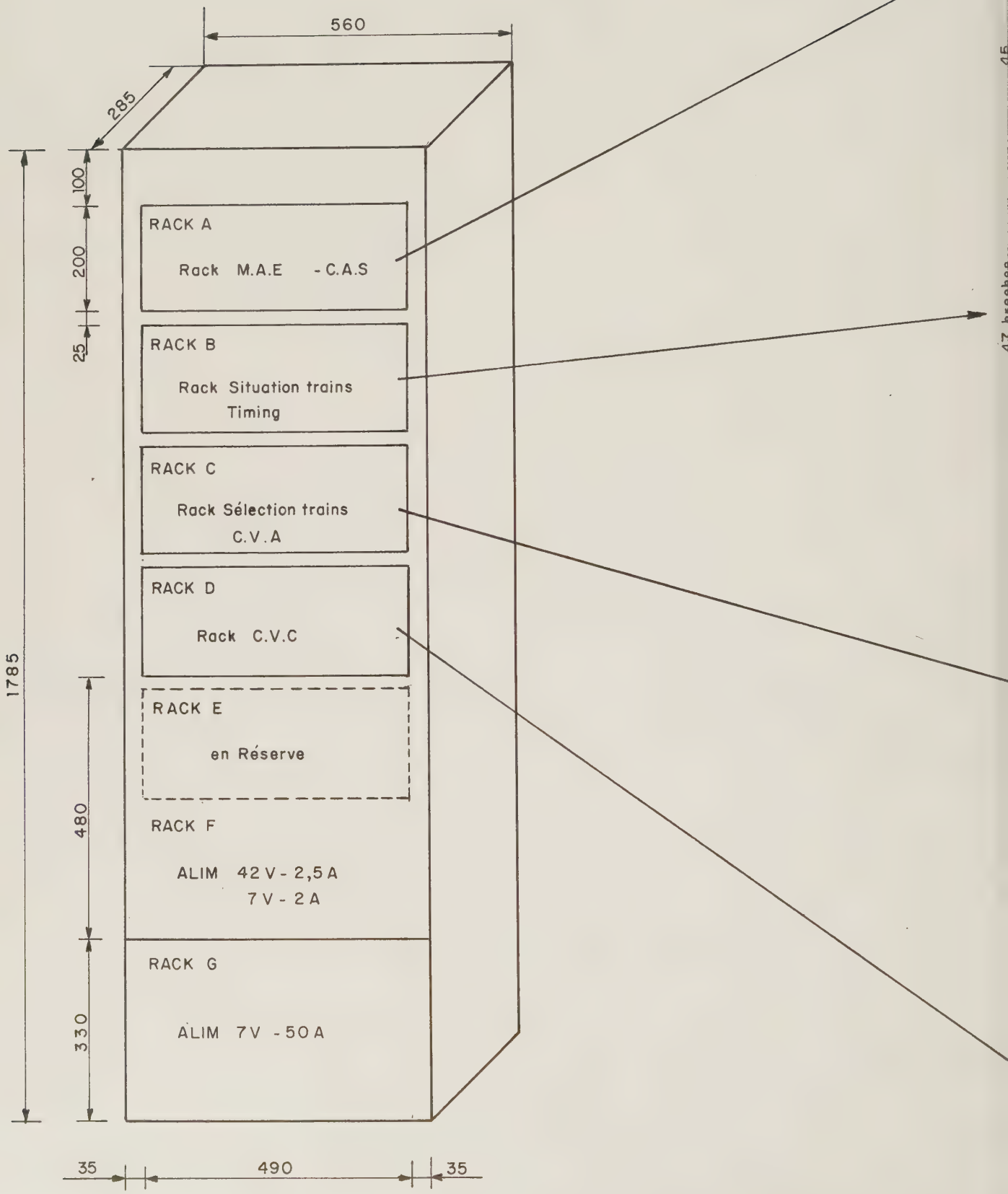
Figure 4.11 a 2

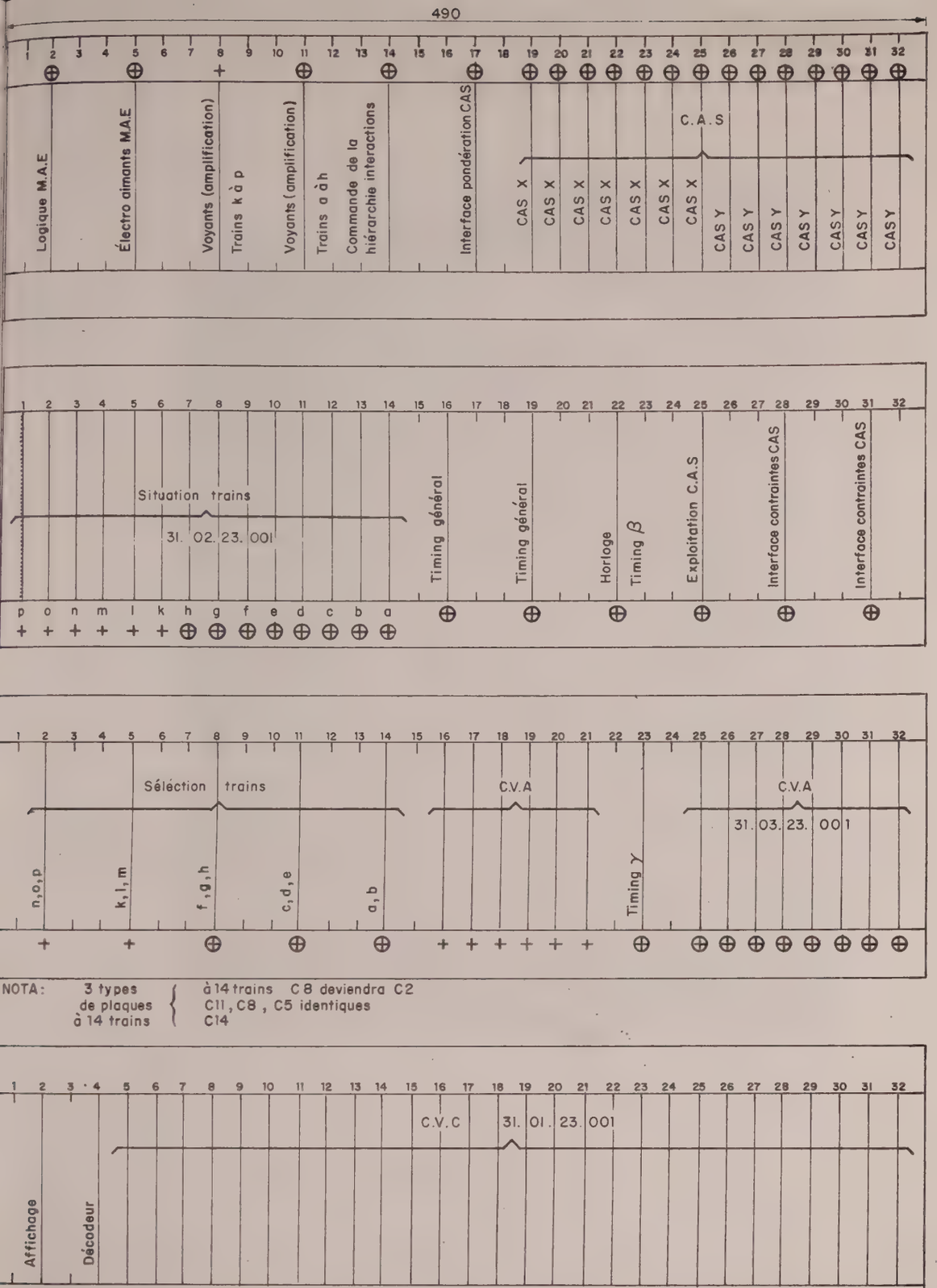
voir page suivante

# IMPLANTATION DES PLAQUES LOGIQUES

## ARMOIRE ( vue arrière)

Figure 4.11 a2





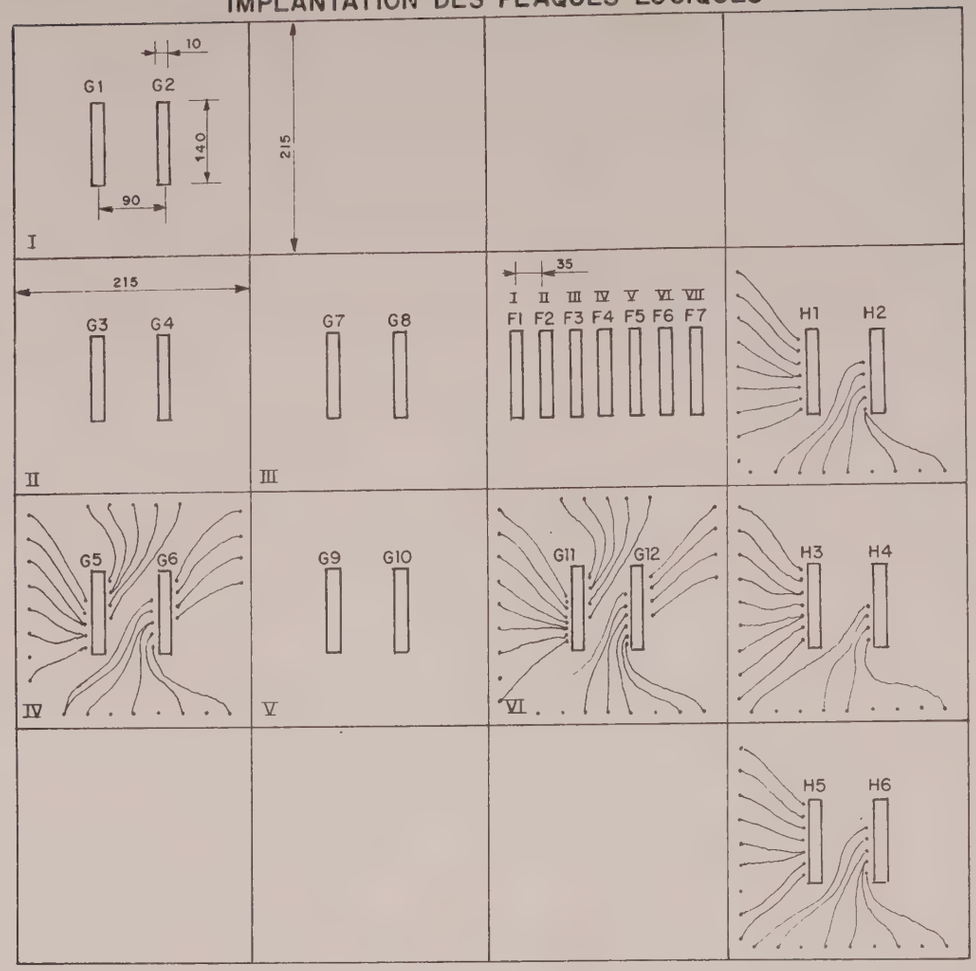

NOTA: 3 types de plaques à 14 trains { à 14 trains C 8 deviendra C2 ; C11, C8, C5 identiques ; C14

⊕ Plaques nécessaires pour 8 trains
\+ Plaques supplémentaires pour 14 trains
d : C.V.C diagonal 31.01.23.002

LÉGENDE :

71.03.10-2722/RK

## IMPLANTATION DES PLAQUES LOGIQUES




PANNEAU ARRIÈRE Figure 4.11 a1

F1 Registre hiérarchie - cantons
F2 Registre position sur canton final et initial (balayage)
F3, F4 Amplification des matrices
F5 Choix itinéraires
F6 Logique liée à l'affectation des trains
F7 Amplis-liaisons - Sélection manuelle et automatique
F8, F9 Sorties configuration des voies

G1, G3, G5, G7, G9, G11 Entrées base contraintes (31.08.23.002)

G2, G4, G6, G8, G10, G12 Sorties base contraintes (31.08.23.003)

H1, H3, H5 Sorties pondération (31.08.23.009)

H2, H4, H6 Entrées pondération (31.08.23.011)

71.03.11-2723/RK

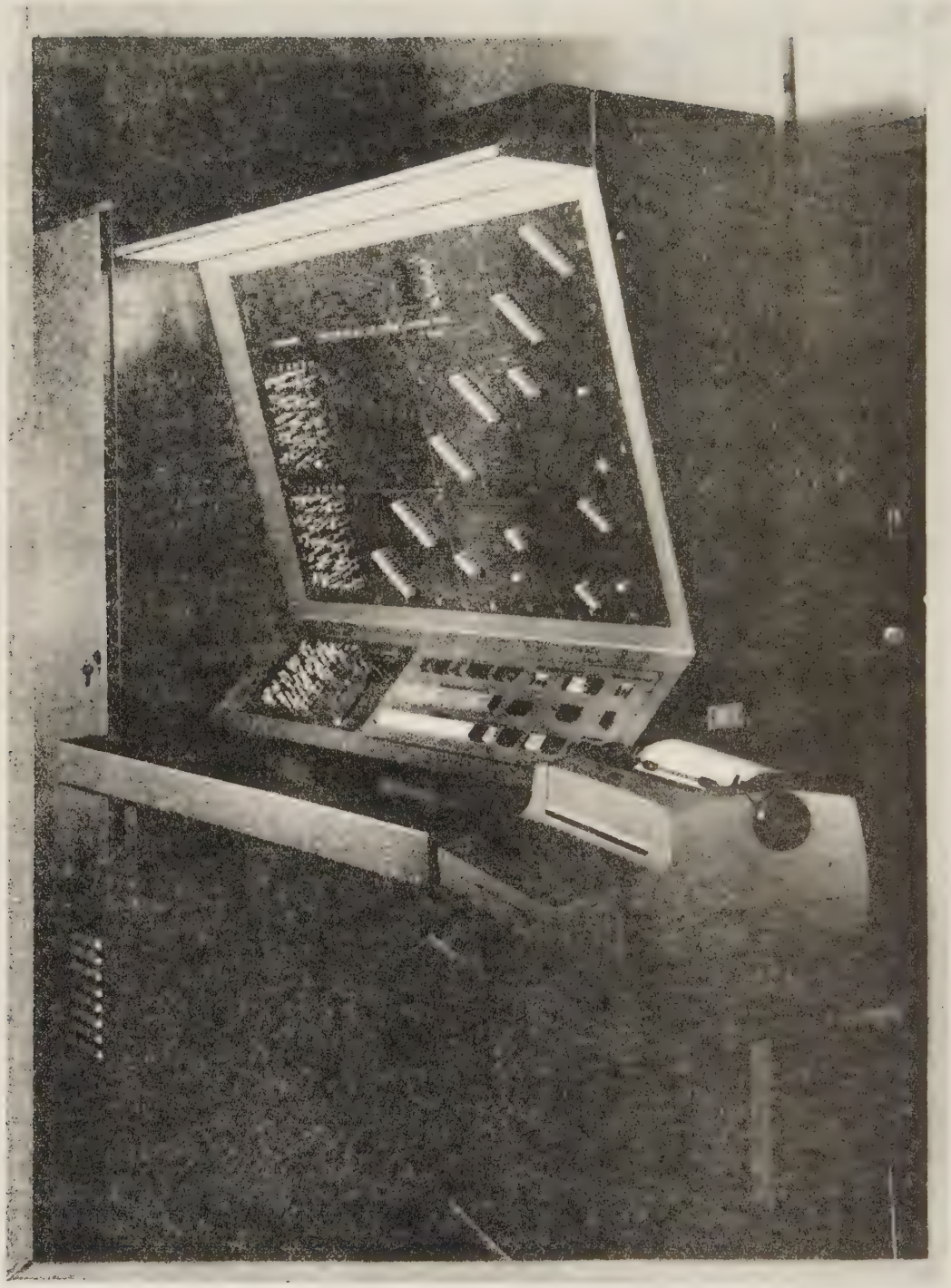


Figure 4.11b

71.03.25-2782/RK

ORIGINAL

# SIMULATEUR "MÉMOIRE ACTIVE."

## encombrement

( cotes en m/m )

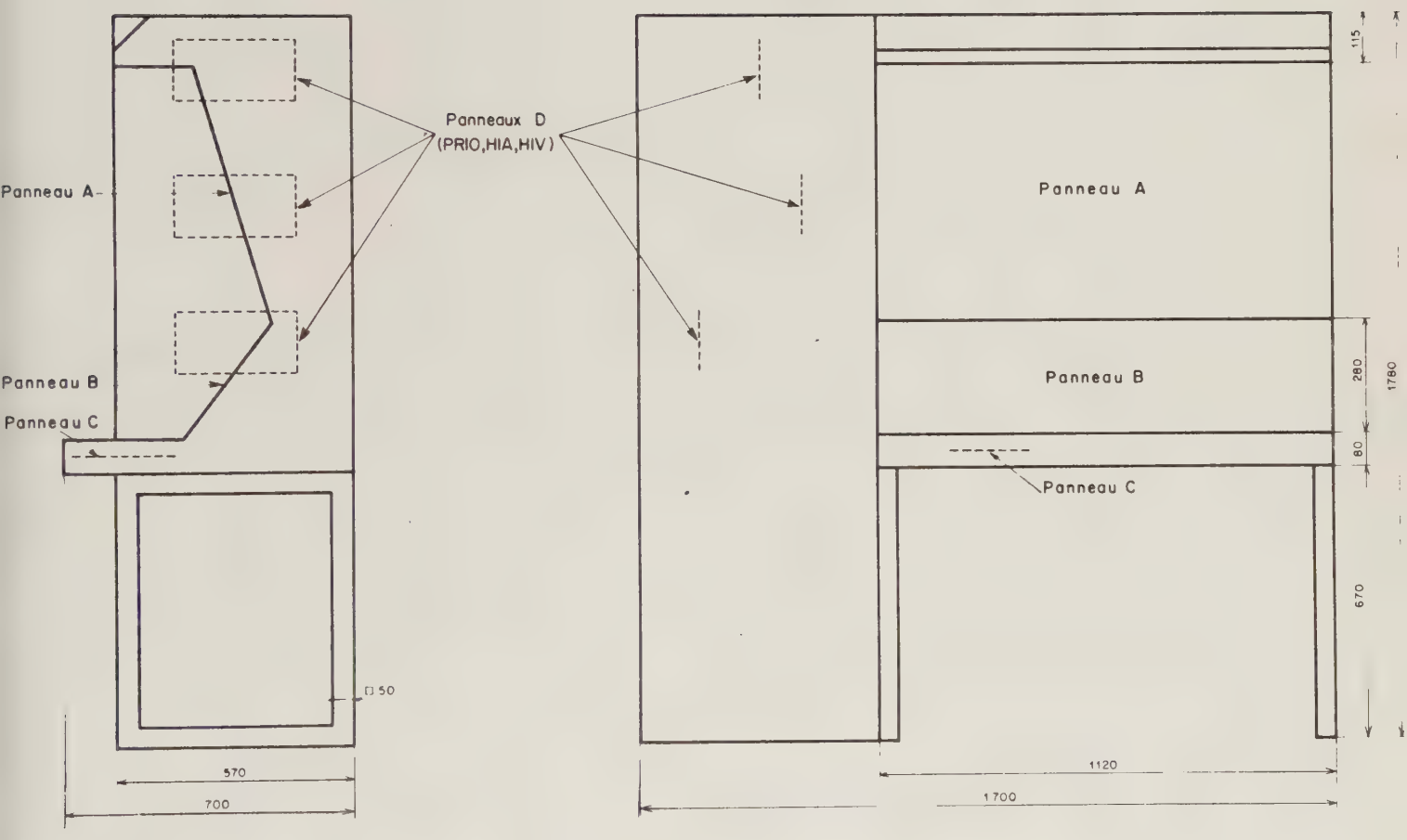
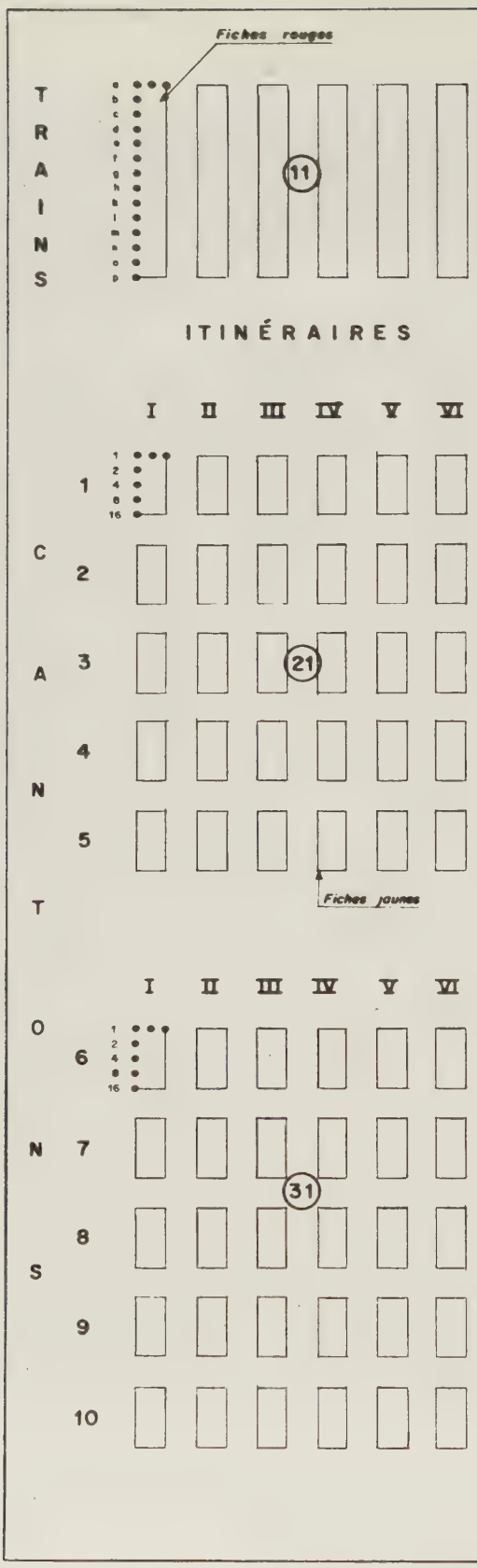


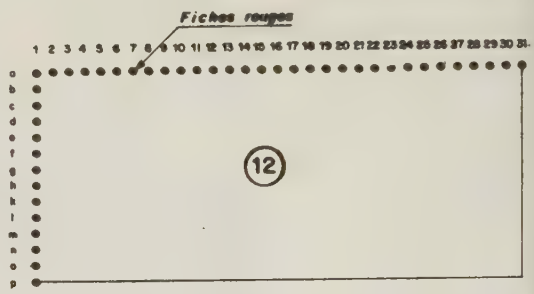

Figure 411c

SIMULATEUR " MEM

face avan

**Panneau A :**




POSITION INITIALE SUR LE CANTON

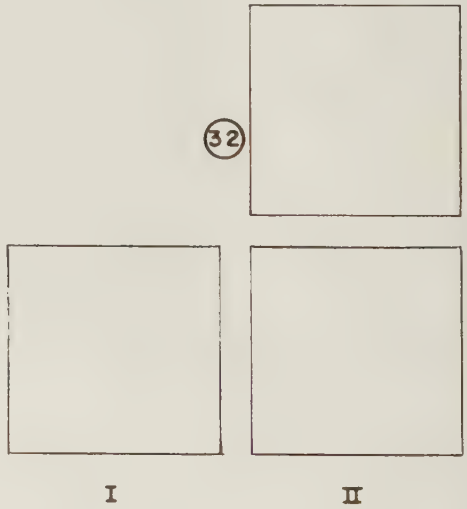
SIMULATEUR DE MOUVEMENTS DE TRAINS

S N C F

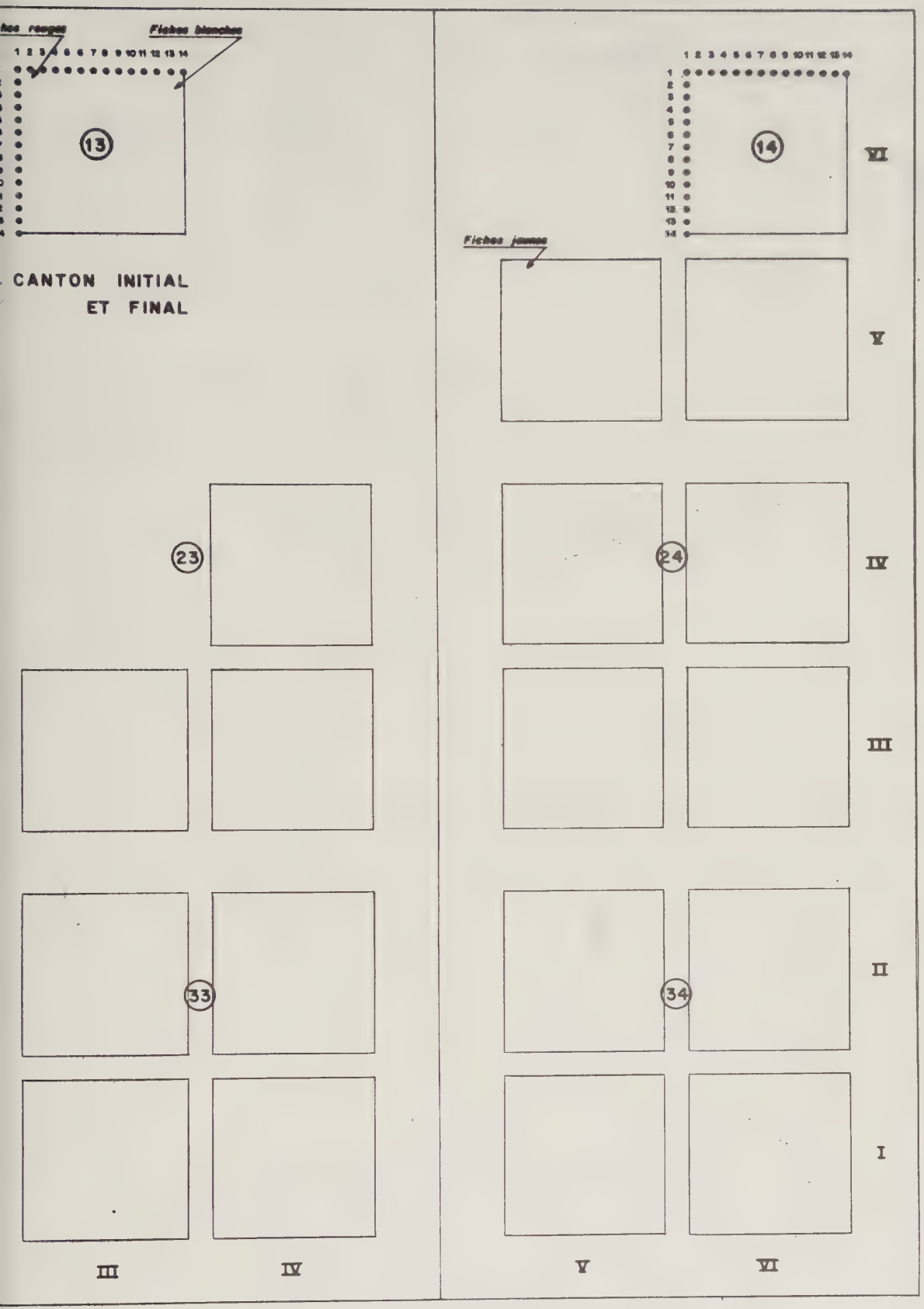
MÉMOIRE ACTIVE

22

S N E C M A




Fig




(11) Matrice d'affectation des trains

(12) Matrice position initiale sur le canton (départ)

(13) Matrice canton initial et canton final

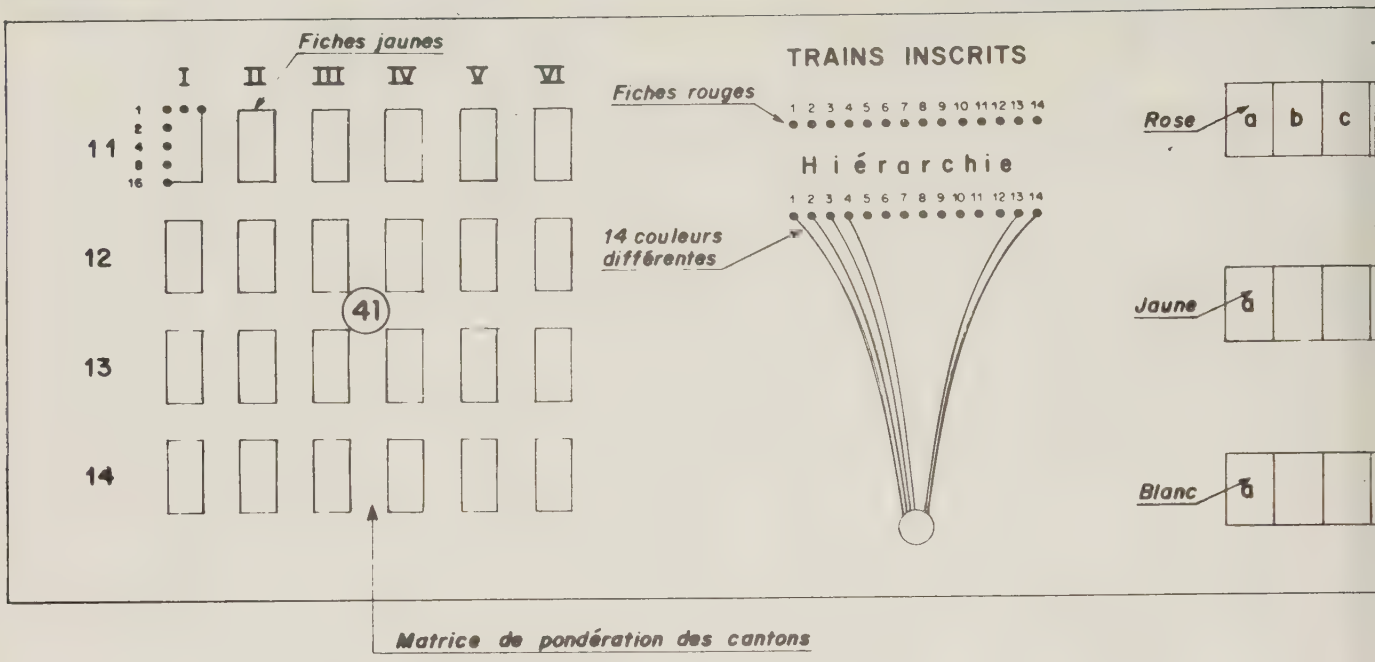
(14) (23) (24) (32) (33) (34) - Matrice' des contraintes

(21) (31) Matrice de pondération des cantons

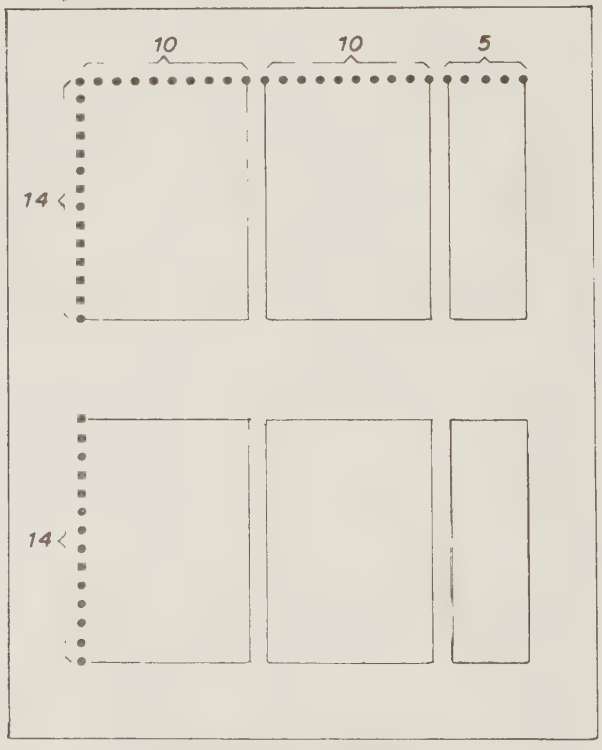
(22) Plaque d'identification

d

**Panneau B:**

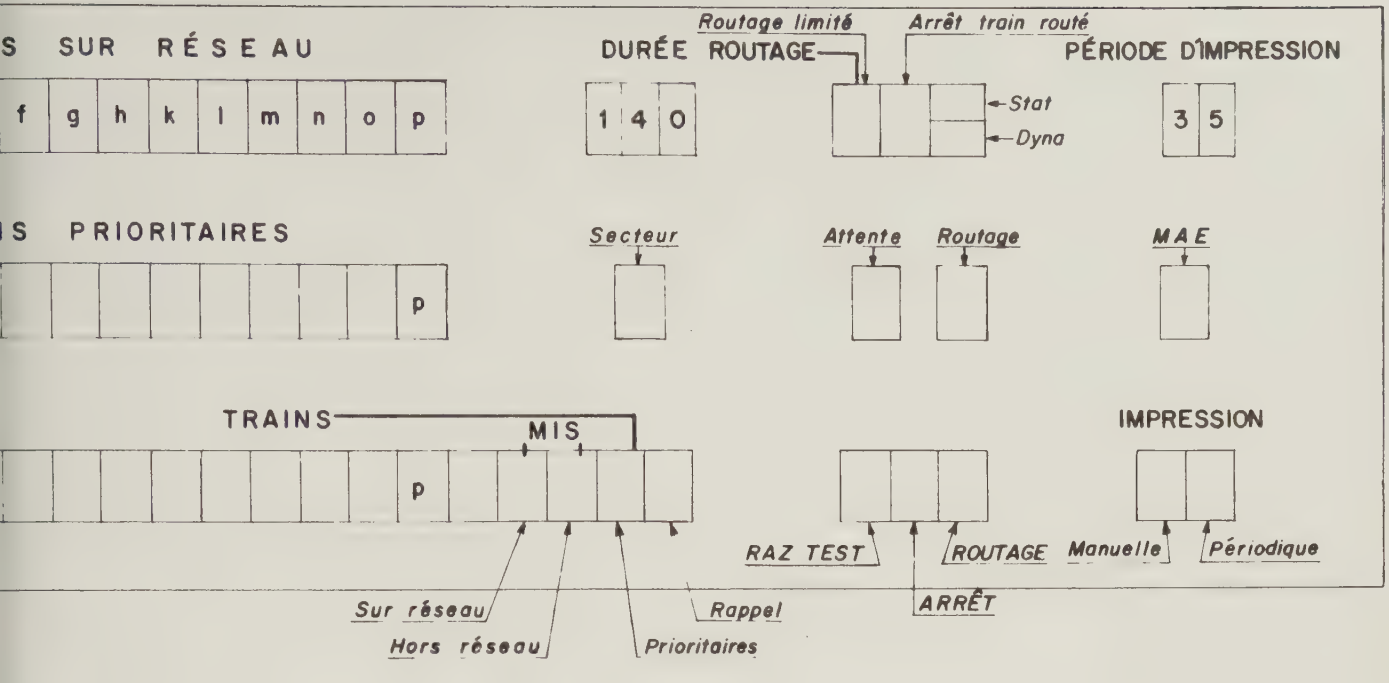



**Panneau C:** *Matrice configuration des voies.*

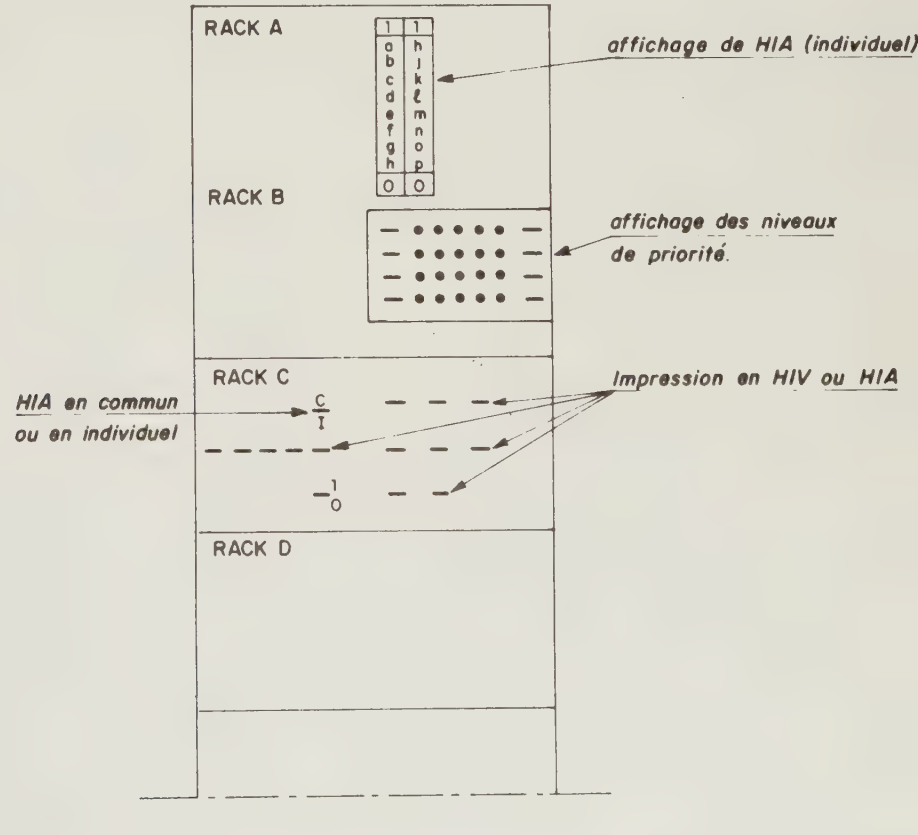



Fig

ÉMOIRE ACTIVE"




**Panneaux D** : *Affichage : niveaux priorités, HIA commun - Individuel, Impression en HIA, Impression en HIV*




le

# CHAPITRE 5

## *Evaluation des performances*

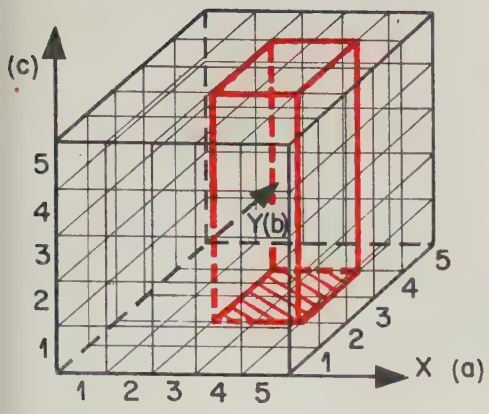



Figure 51a

Représentation d'une contrainte

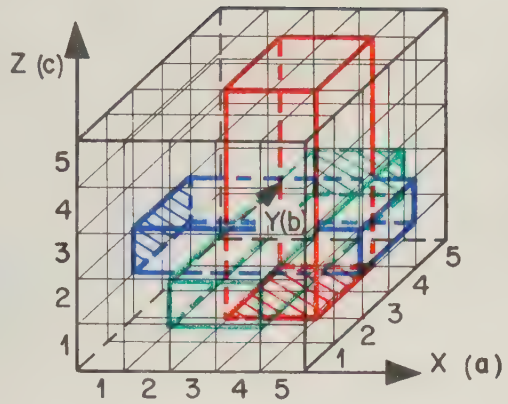



Figure 51b

Représentation de 3 contraintes

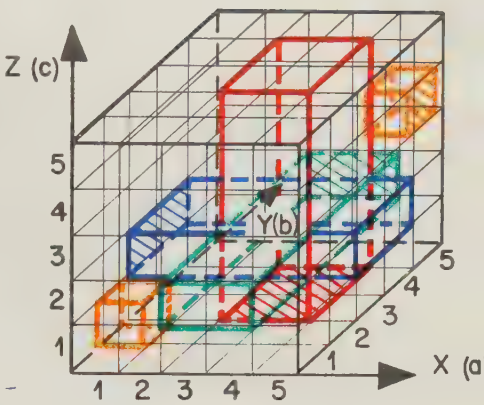
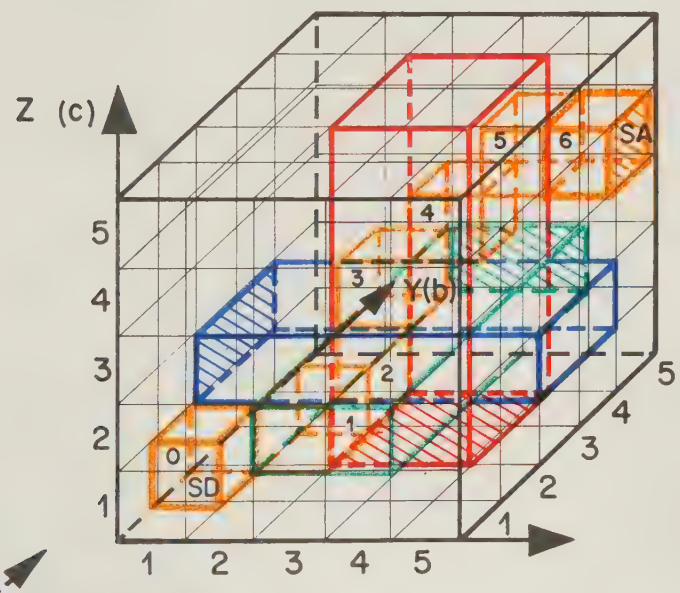



Figure 51c

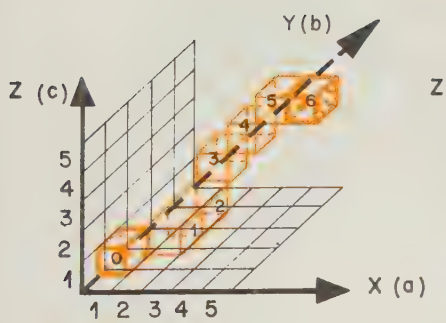
Matérialisation des données du probleme

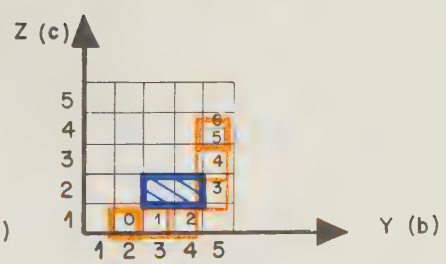


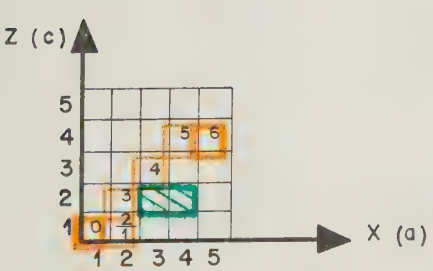

HIERARCHIE

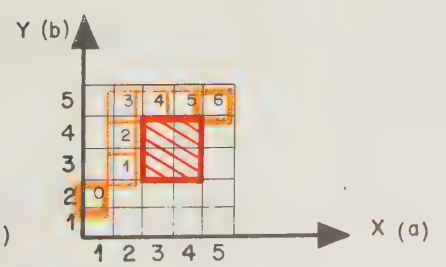
INTERVARIABLES a b c

PAS DE PRIORITE



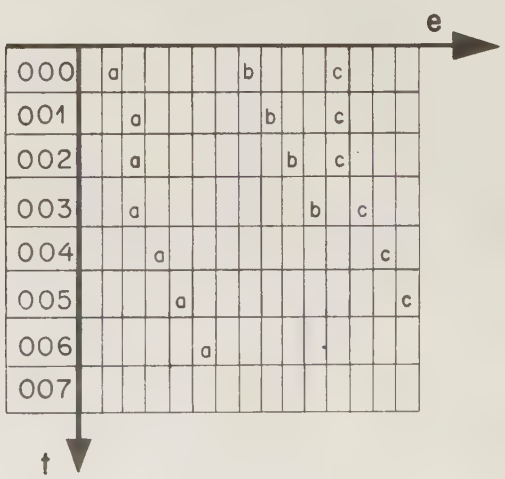




Figure 51d

71.03.25-2783/RK

EXEMPLE D'UNE MAUVAISE SOLUTION
EN 7 PAS

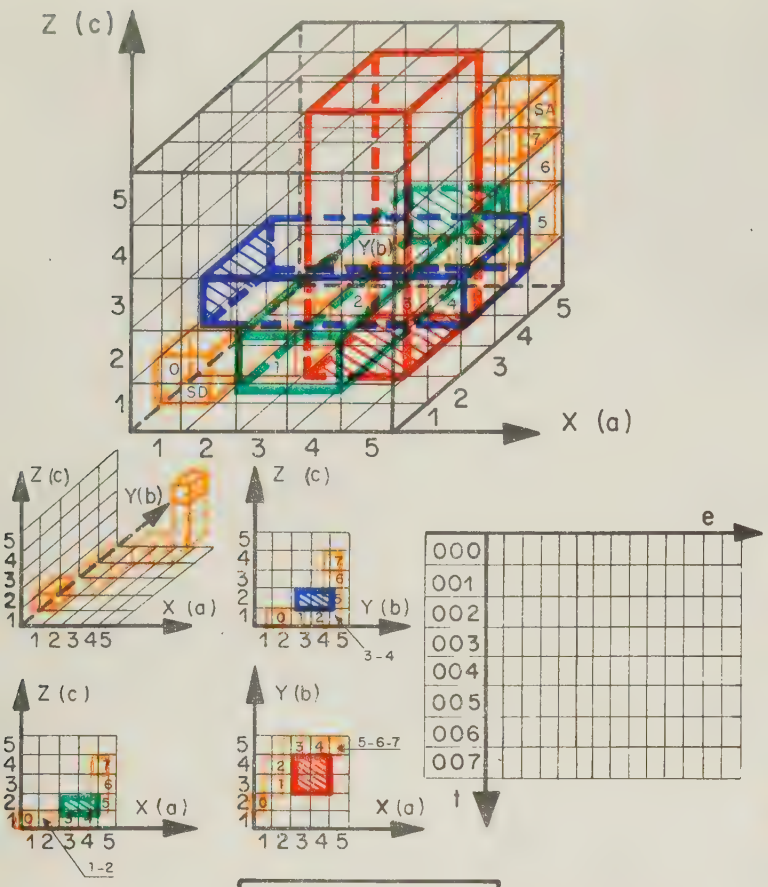



Figure 51e

HIERARCHIE INTERVARIABLES c b a
C: prioritaire

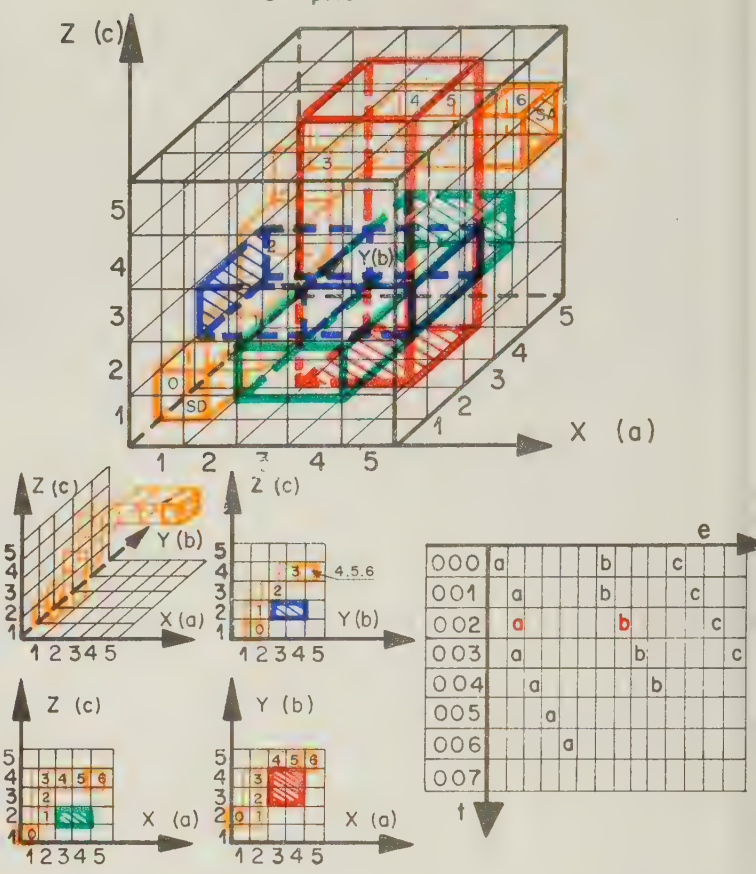



Figure 51f

HIERARCHIE INTERVARIABLES c a b
C : prioritaire

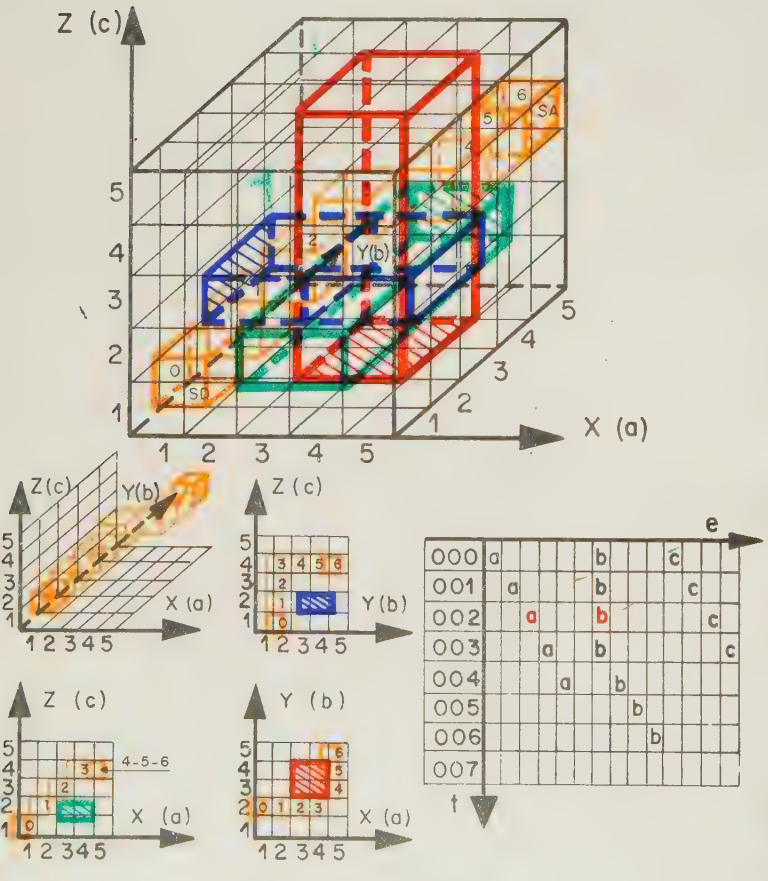
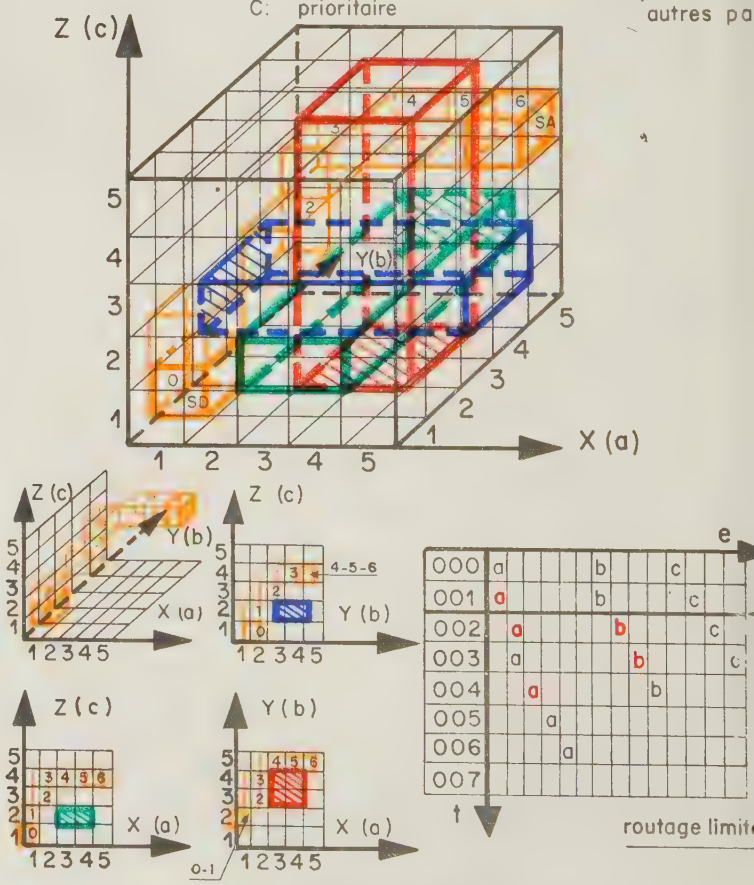



Figure 51g

HIERARCHIE INTERVARIABLES a b c
HIERARCHIE INTERACTIONS 0 1 1 (pour le 1er p
HIERARCHIE INTERACTIONS 1 1 1 (pour les
C: prioritaire
autres pa




routage limit

Figure 51h

71.03.25-2784/RK

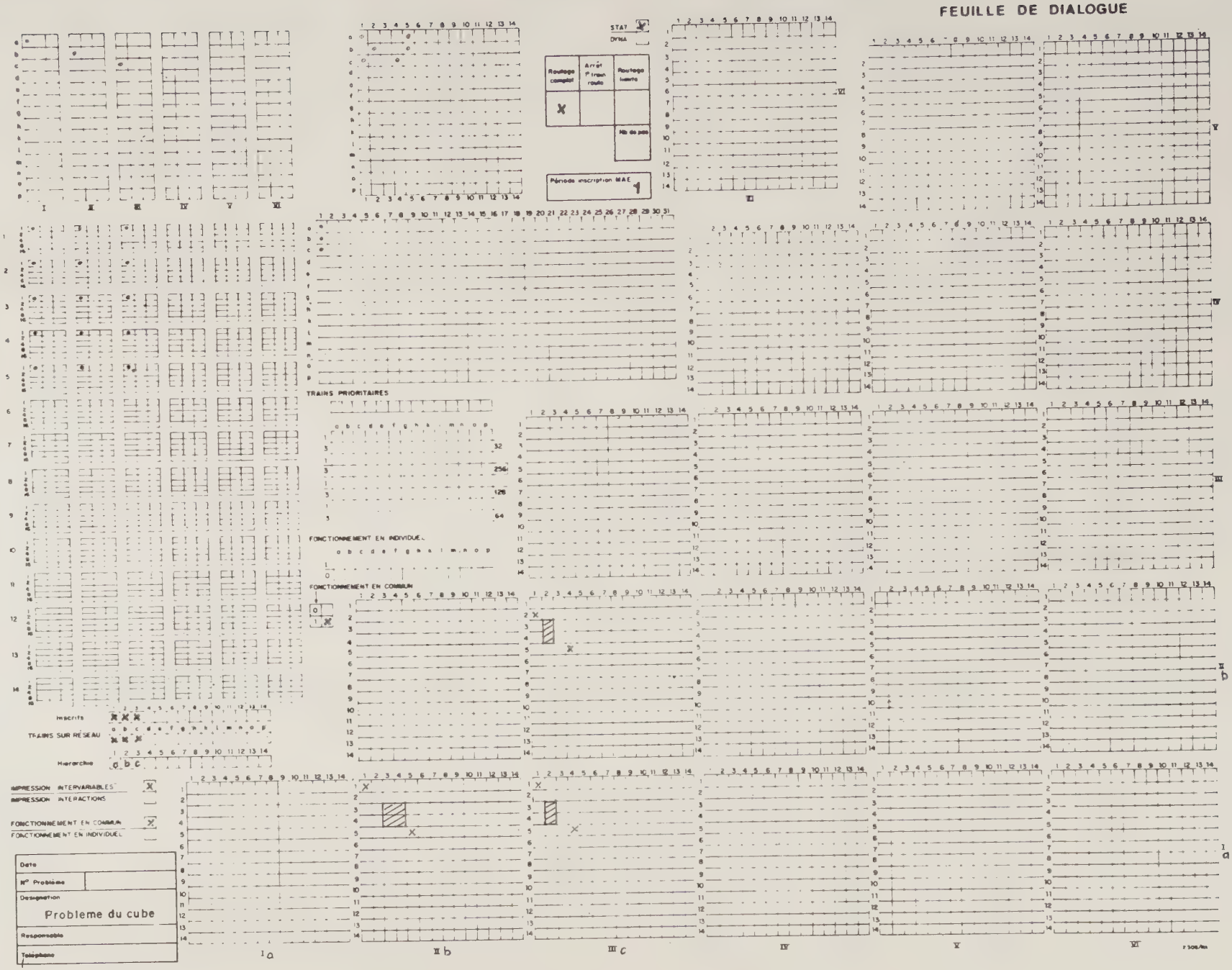
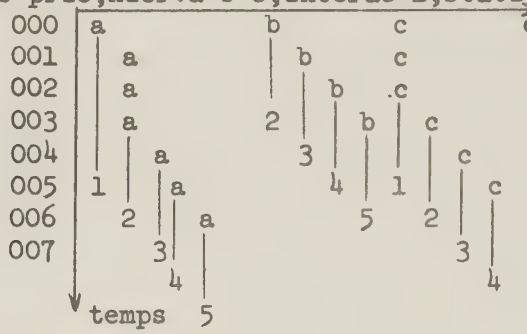

FEUILLE DE DIALOGUE
STAT
DYNA
Routage complet
Arrêt 1er train route
Routage lisent
Nb de pas
Période inscription MAE
TRAINS PRIORITAIRES
FONCTIONNEMENT EN INDIVIDUEL
FONCTIONNEMENT EN COMMUN
Inscrits
TRAINS SUR RESEAU
Hierarchie
IMPRESSION INTERVARIABLES
IMPRESSION INTERACTIONS
FONCTIONNEMENT EN COMMUN
FONCTIONNEMENT EN INDIVIDUEL
Date
N° Probleme
Designation
Probleme du cube
Responsable
Telephone
Ia
IIb
IIIc
IV
V
VI

Figure 51j

# MODES DE FONCTIONNEMENT

Listing 51 k

1)ROUTAGE GLOBAL;sans prio,hier:a b c,interac=1,statique;MAE{automatique / impression tous les pas




2)ROUTAGE LIMITE à 3 pas;mêmes paramètres que pour 1

```
000  a          b       c
001    a          b     c
002    a            b   c
003    a              b   c
```

3)ARRET TRAIN ROUTE (train b);mêmes paramètres que pour 1

```
000  a          b       c
001    a          b     c
002    a            b   c
003    a              b   c
004      a                 c
```

4)ARRET EN COURS DE TRAITEMENT (à 4 pas);mêmes paramètres que pour 1

```
000  a          b       c
001    a          b     c
002    a            b   c
003    a              b   c
Arrêt du problème 004      a                 c
Nouveau routage   005        a                 c
                  006
                  007          a
```

5)ROUTAGE SANS IMPRESSION;mêmes paramètres que pour 1

```
000  a          b       c
007
```

6)IMPRESSION TOUS LES 2 PAS (n=2);mêmes paramètres que pour 1

```
000  a          b       c
002    a            b   c
004      a                 c
006
007          a
```

7)ROUTAGE GLOBAL b NON INSCRIT;mêmes paramètres que pour 1

```
000  a                 c
001    a               c
002    a               c
003    a                 c
004      a               c
005        a               c
006          a
007
```

8)ROUTAGE GLOBAL SANS CONTRAINTE;mêmes paramètres que pour 1

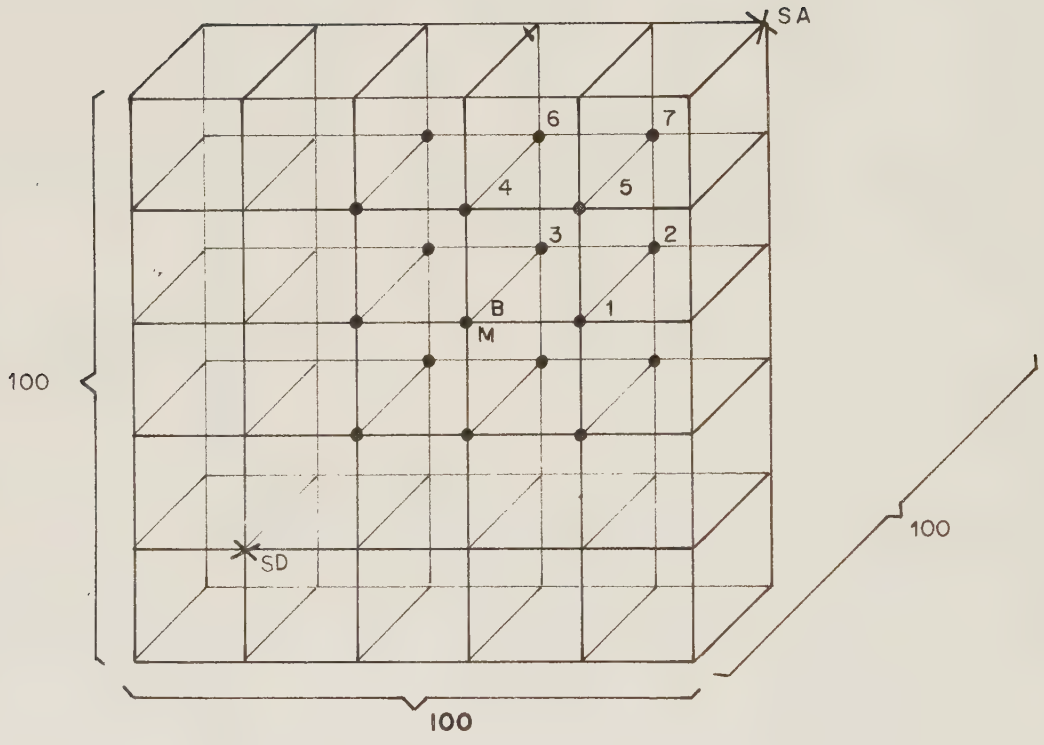
```
000  a          b       c
001    a          b       c
002      a          b       c
003        a          b       c
004          a
005
```

RESULTATS

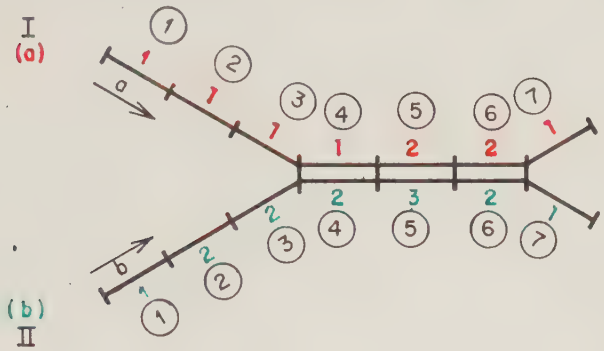
```
                                                                  (automatique
1)ROUTAGE GLOBAL;sans prio,hier:a b c,interac=1,statique;MAE(
                        000  a          b       c                (impression:tous les pas
                        001    a          b     c
                        002    a            b   c
                        003    a              b   c
                        004      a                  c
                        005       a                   c
                        006         a
                        007

2)ROUTAGE GLOBAL;prio:c,hier:c b a,interac=1
                        000  a          b       c
                        001    a        b         c
                        002    a          b         c
                        003    a            b         c
                        004      a            b
                        005       a
                        006         a
                        007

3)ROUTAGE GLOBAL;prio:c,hier:c a b,interac=1
                        000  a          b       c
                        001    a        b         c
                        002      a      b           c
                        003       a     b             c
                        004         a     b
                        005                 b
                        006                   b
                        007

4)ROUTAGE GLOBAL;prio:c,hiera b c,interac:a=0/1,bc=1
                        000  a          b       c
                        001  a          b         c
                        002    a          b         c
                        003    a            b         c
                        004      a            b
                        005       a
                        006         a
                        007

5)ROUTAGE GLOBAL;prio:c,hier:a b c,interac:a=0,bc=1
                        000  a          b       c
                        001  a          b         c
                        002  a            b         c
                        003  a              b         c
                        004  a                b
                        005    a
                        006      a
                        007       a
                        008         a
                        009
```

Listing 51 m

Fig 516 a



Bifurcation simple de voies de chemin de fer



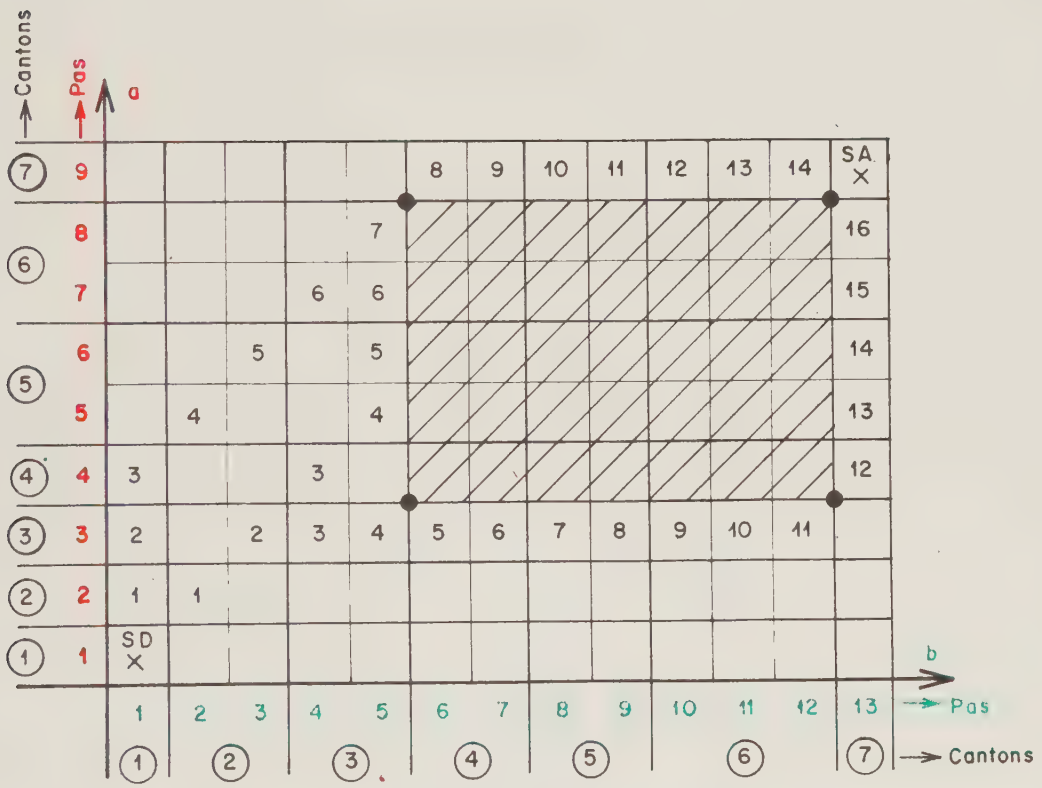
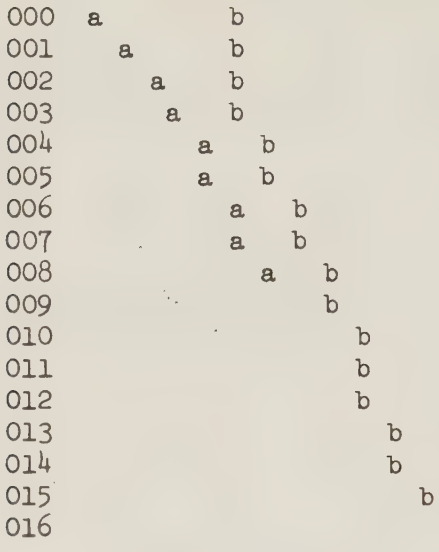



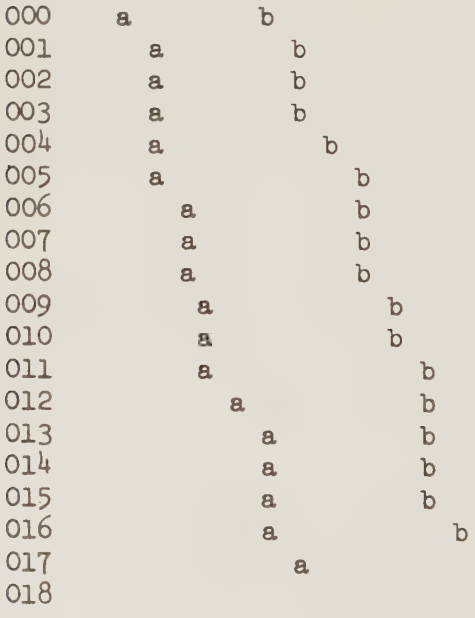

Figure 52 a

BIFURCATION SIMPLE DE VOIES DE CHEMIN DE FER




Listing 52 b

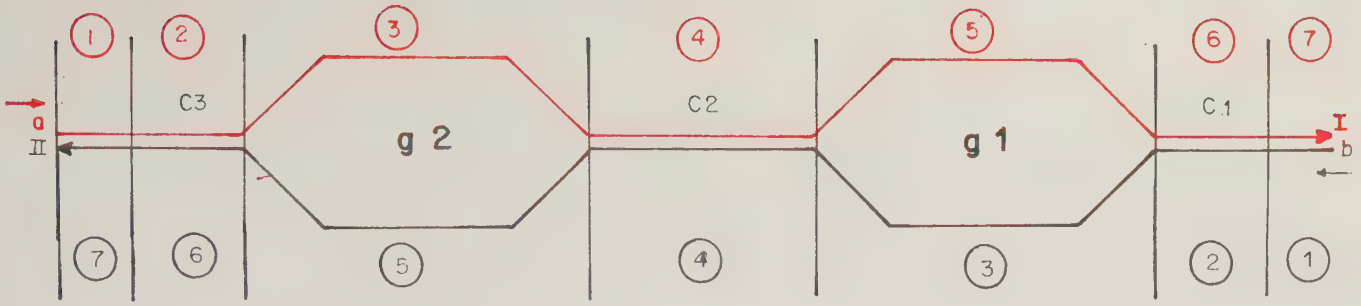
VOIE UNIQUE AVEC EVITEMENTS DE"NEZ A NEZ"




Listing 52 f

# 522 Voie unique avec évitements de " nez à nez "

Fig 52 c



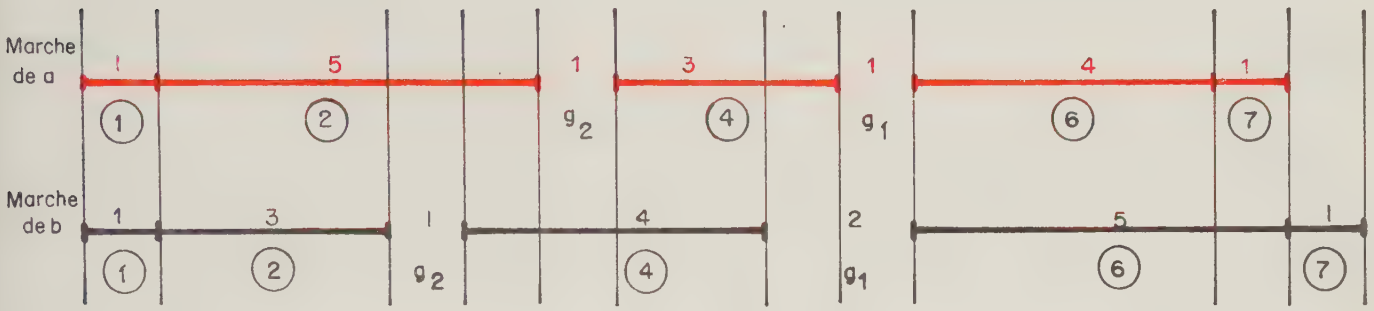




Fig. 52 d

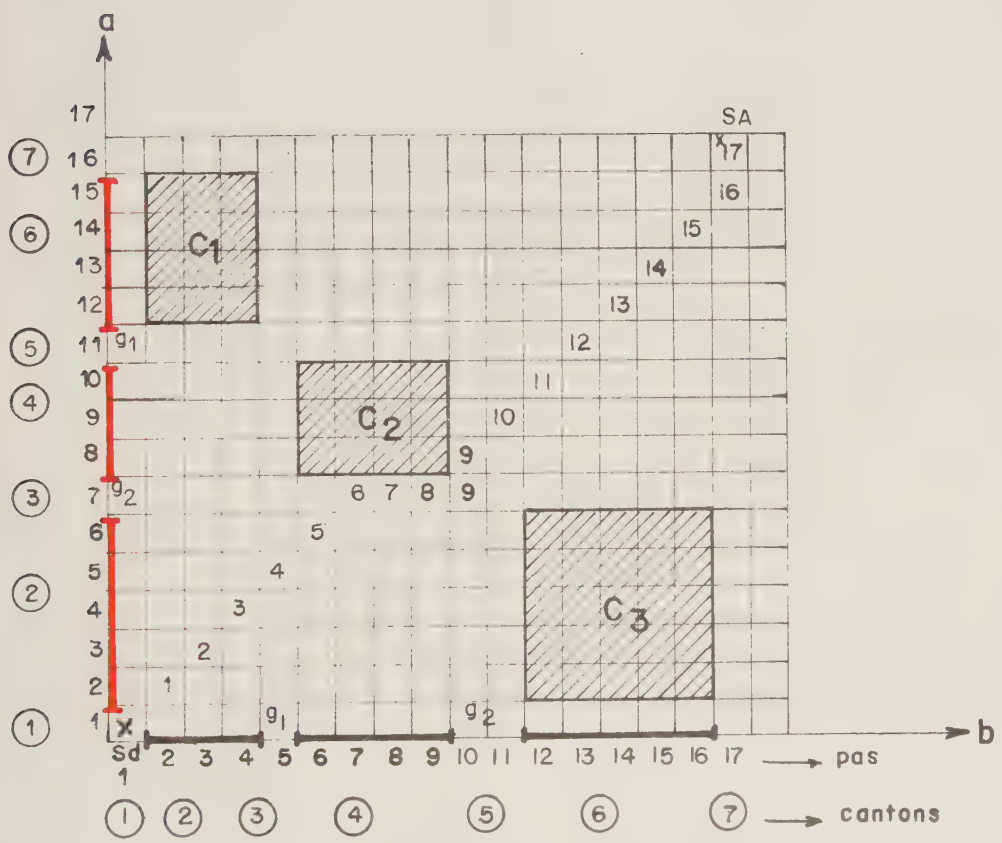
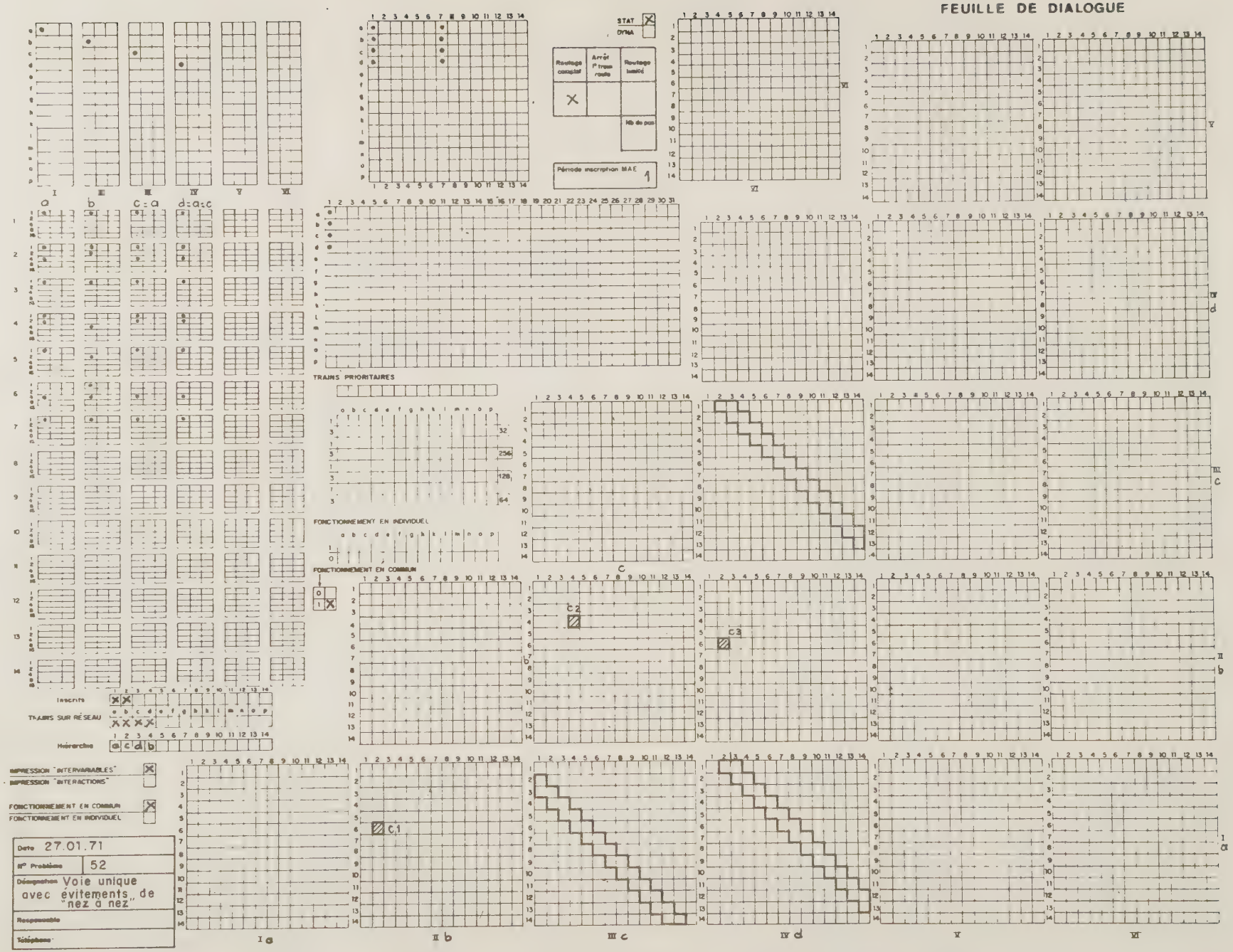



Fig. 52 e

Figure 52g




71.03.09-2718/RK

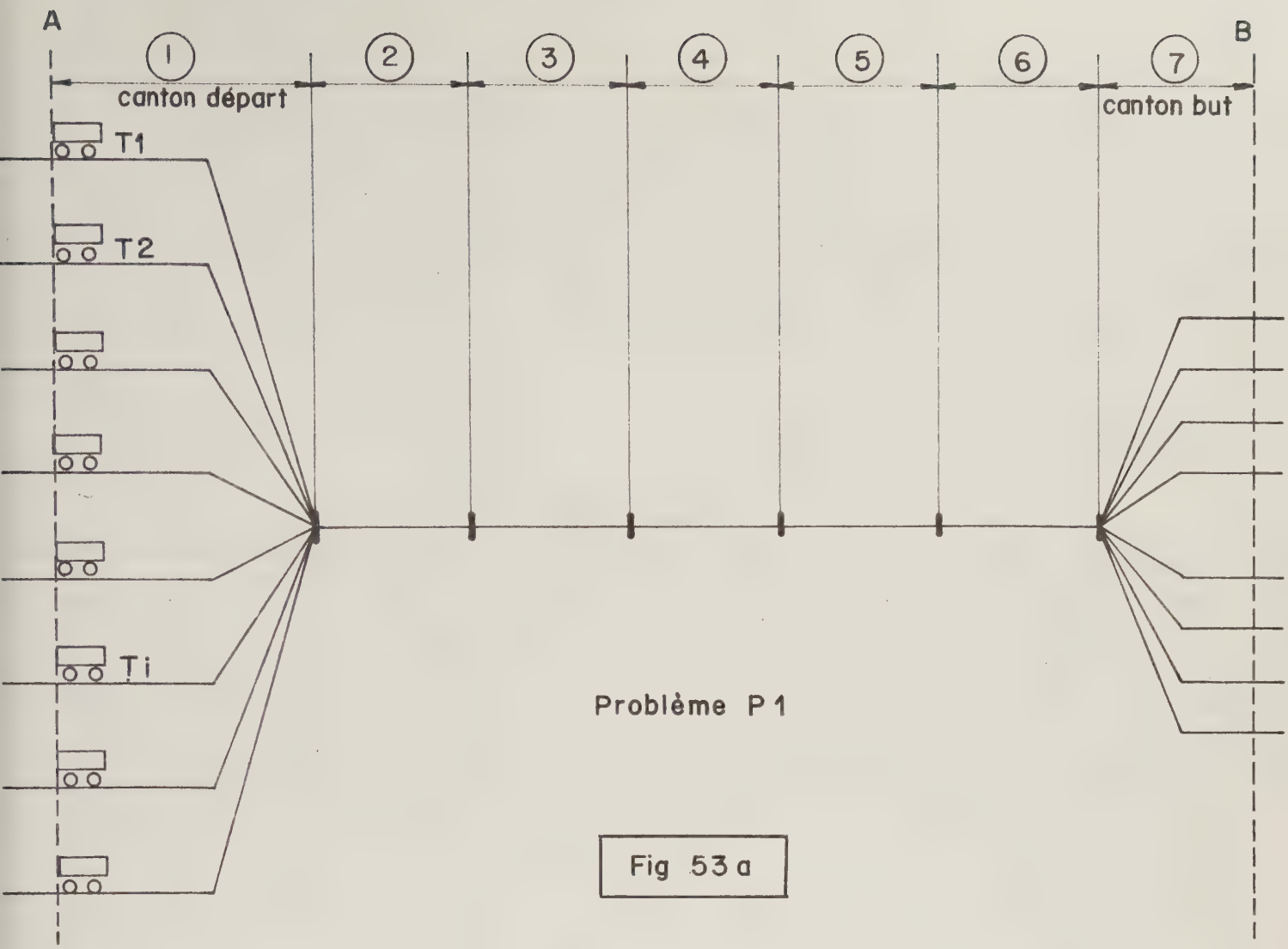



Fig 53 a

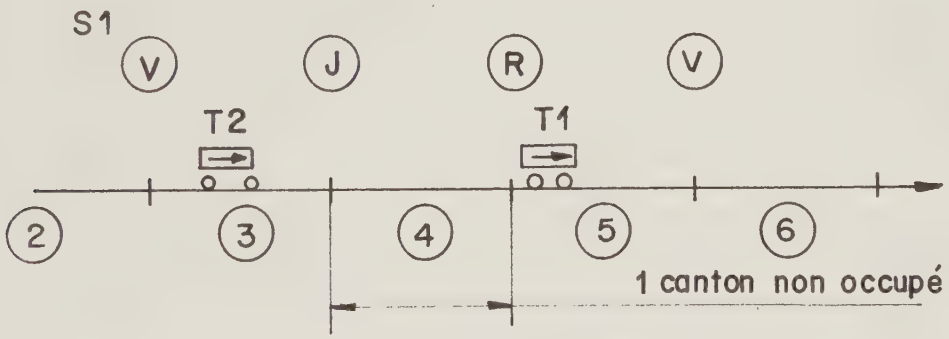
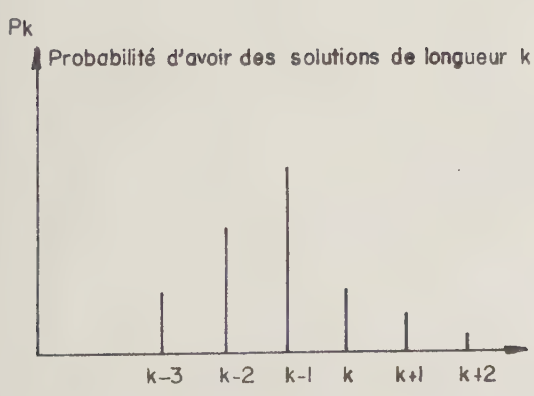



Fig 53 b




Module des solutions ou arrangements

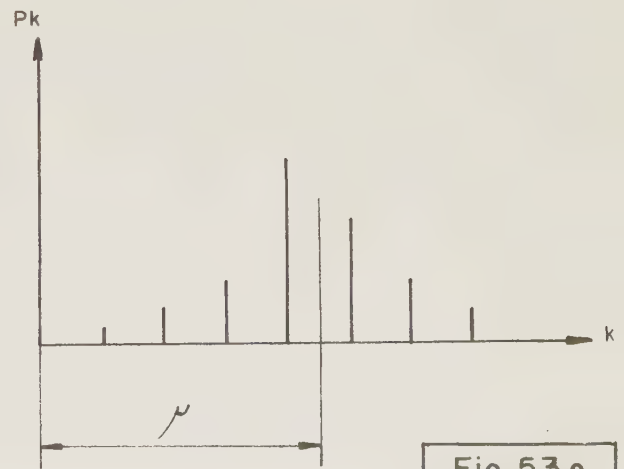



Fig 53 d

Fig 53 e

71.04.16-2875/RK

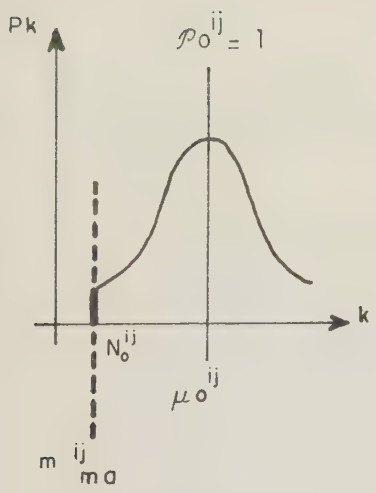



Fig. 53f

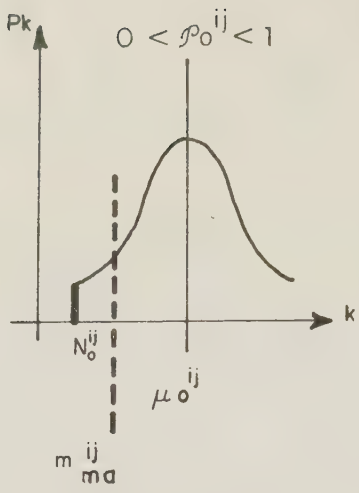



Fig. 53g

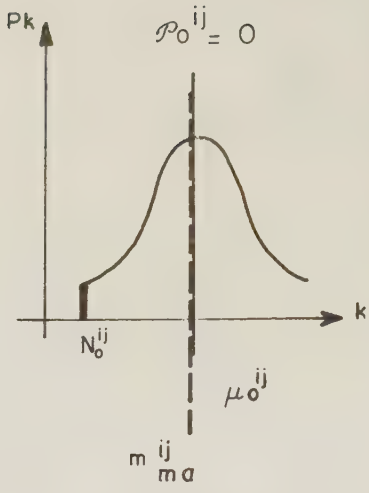



Fig. 53h

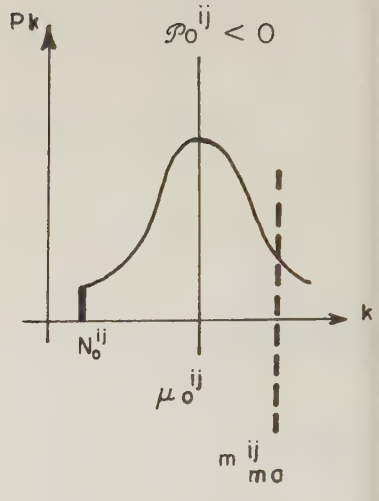


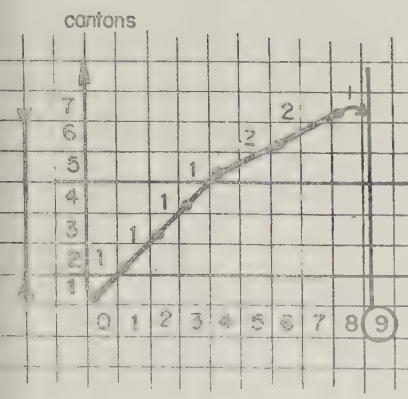

Fig. 53j

## Tableau 534 a

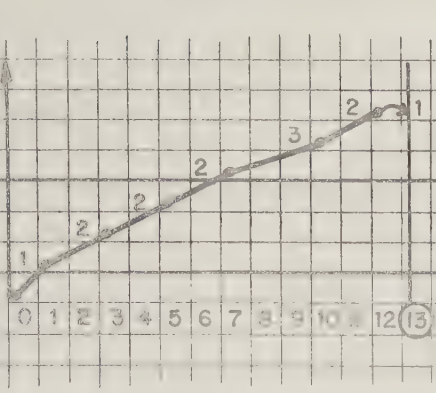
| Nom de l'expérience | Groupement de variables utilisé | | | | | | | | Nom de l'experience | Groupement de variables utilisé | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 | a | b | | | | | | | 61 | a | b | c | d | e | f | | | | |
| 22 | | b | c | | | | | | 62 | | b | c | d | e | f | g | | | |
| 23 | | | c | d | | | | | 63 | | | c | d | e | f | g | h | | |
| 24 | | | | d | e | | | | 64 | a | | | d | e | f | g | h | | |
| 25 | | | | | e | f | | | 65 | a | b | | | e | f | g | h | | |
| 26 | | | | | | f | g | | 66 | a | b | c | | | f | g | h | | |
| 31 | a | b | c | | | | | | 71 | g a | b | c | d | e | f | | | | g ≡ a |
| 32 | | b | c | d | | | | | 72 | | b h | c | d | e | f | g | | | h ≡ b |
| 33 | | | c | d | e | | | | 73 | | | d c | d | e | f | g | h | | a ≡ c |
| 34 | | | | d | e | f | | | 74 | a | | | b d | e | f | g | h | | b ≡ d |
| 35 | | | | | e | f | g | | 75 | a | b | | | c e | f | g | h | | c ≡ e |
| 36 | | | | | | f | g | h | 76 | a | b | c | | | d f | g | h | | d ≡ f |
| 41 | a | b | c | d | | | | | 81 | g a | h b | c | d | e | f | | | | g ≡ a<br>h ≡ b |
| 42 | | b | c | d | e | | | | 82 | | h b | a c | d | e | f | g | | | h ≡ b<br>a ≡ c |
| 43 | | | c | d | e | f | | | 83 | | | a c | b d | e | f | g | h | | a ≡ c<br>b ≡ d |
| 44 | | | | d | e | f | g | | 84 | a | | | b d | c e | f | g | h | | b ≡ d<br>c ≡ e |
| 45 | | | | | e | f | g | h | 85 | a | b | | | c e | d f | g | h | | c ≡ e<br>d ≡ f |
| 46 | a | | | | | f | g | h | 86 | a | b | c | | | d f | e g | h | | d ≡ f<br>e ≡ g |
| 51 | a | b | c | d | e | | | | | | | | | | | | | | |
| 52 | | b | c | d | e | f | | | | | | | | | | | | | |
| 53 | | | c | d | e | f | g | | | | | | | | | | | | |
| 54 | | | | d | e | f | g | h | | | | | | | | | | | |
| 55 | a | | | | e | f | g | h | | | | | | | | | | | |
| 56 | a | b | | | | f | g | h | | | | | | | | | | | |

variables: a , b, c, d, e, f, g, h

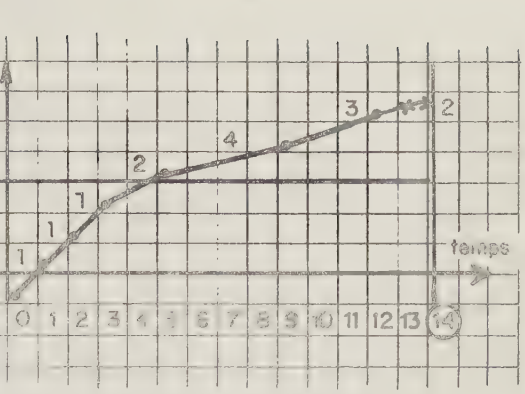
a



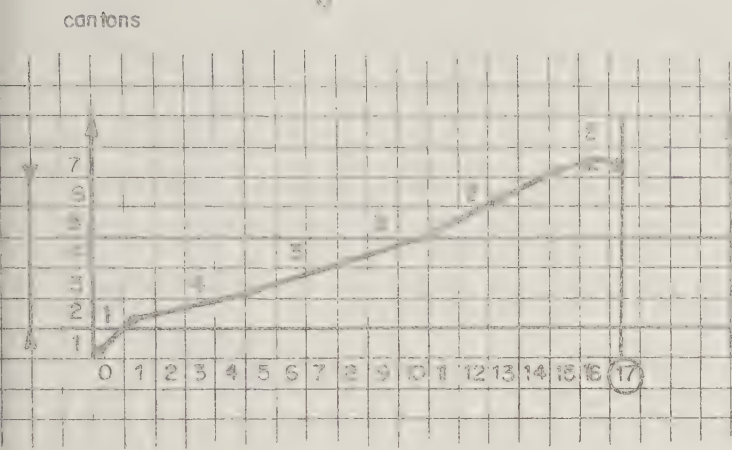

b



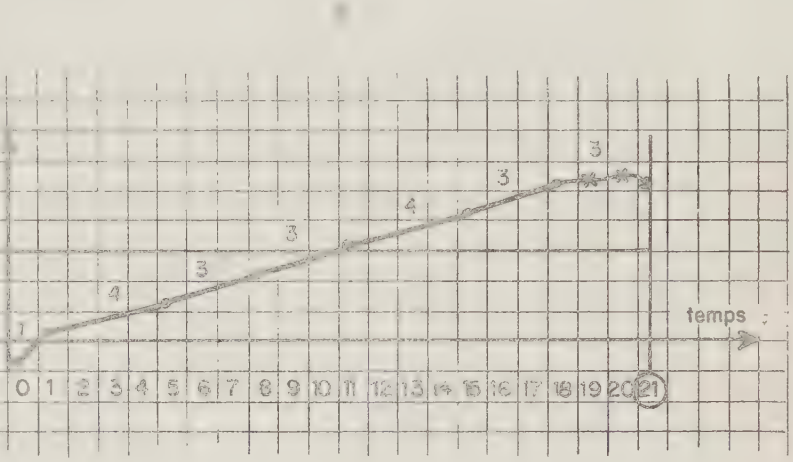

c



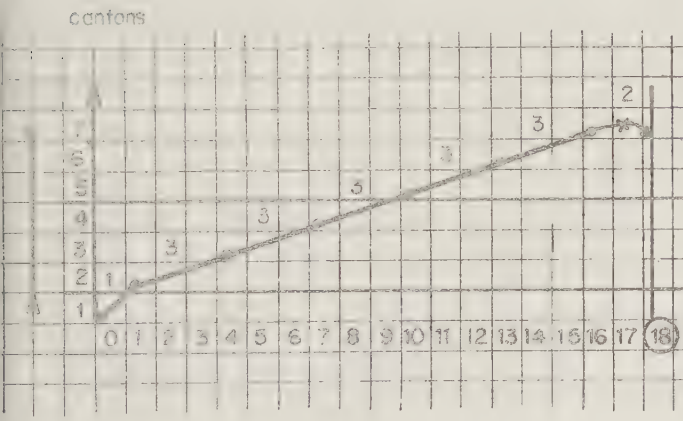

d



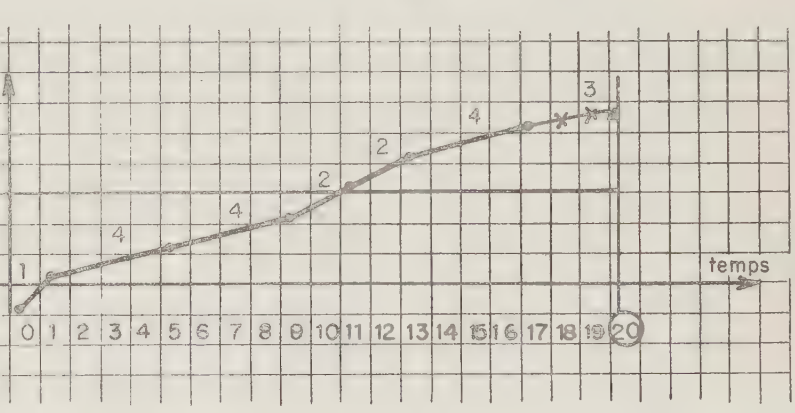

e




f




g




h

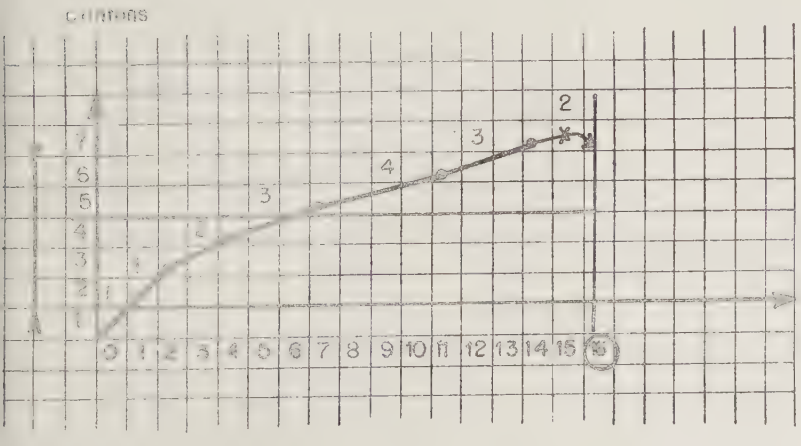



Fig. 53k

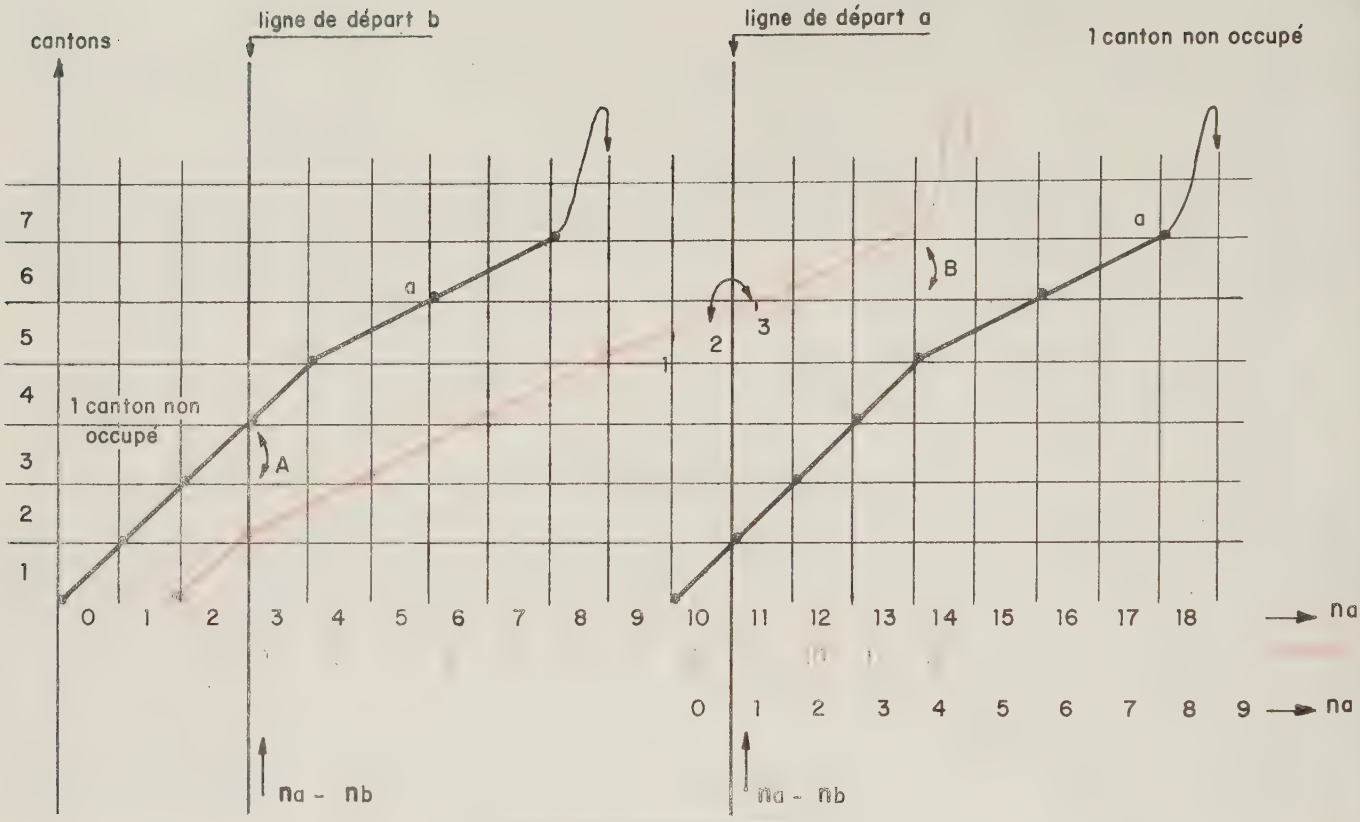



Fig. 534 b

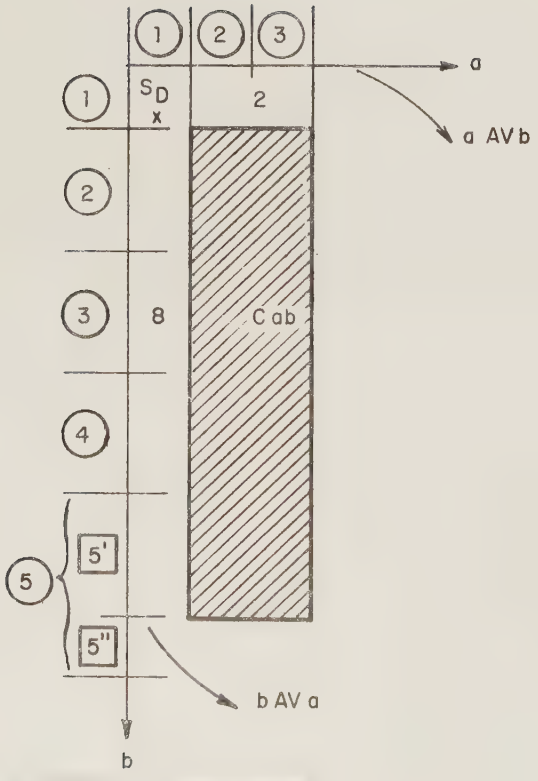


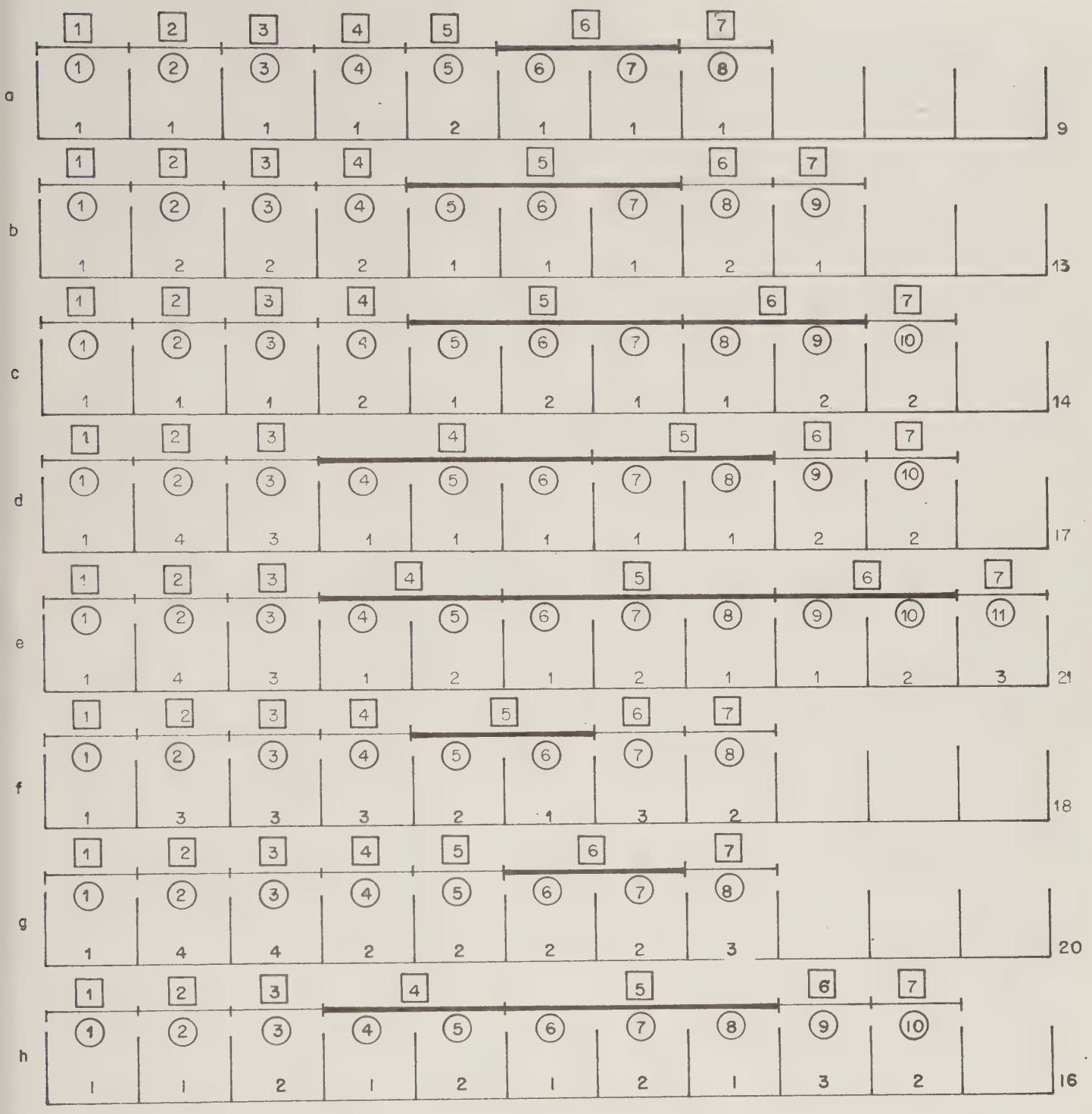

Fig. 534 c

| | a | b | c | d | e | f | g | h |
|---|---|---|---|---|---|---|---|---|
| a | | | 3 | 2 | 2 | 2 | 2 | 2 |
| b | | | 7 | 4 | 4 | 4 | 4 | 6 |
| c | 8 | 5 | | 2 | 2 | 2 | 2 | 5 |
| d | 11 | 8 | 10 | | 7 | 7 | 7 | 9 |
| e | 15 | 11 | 13 | 8 | | 8 | 8 | 11 |
| f | 12 | 9 | 11 | 6 | 6 | | 6 | 9 |
| g | 14 | 10 | 12 | 8 | 8 | 8 | | 10 |
| h | 10 | 7 | 9 | 3 | 3 | 4 | 3 | |

Matrice de dimensionnement des contraintes

Fig. 534e

# Tableau de découpage en cantons fictifs



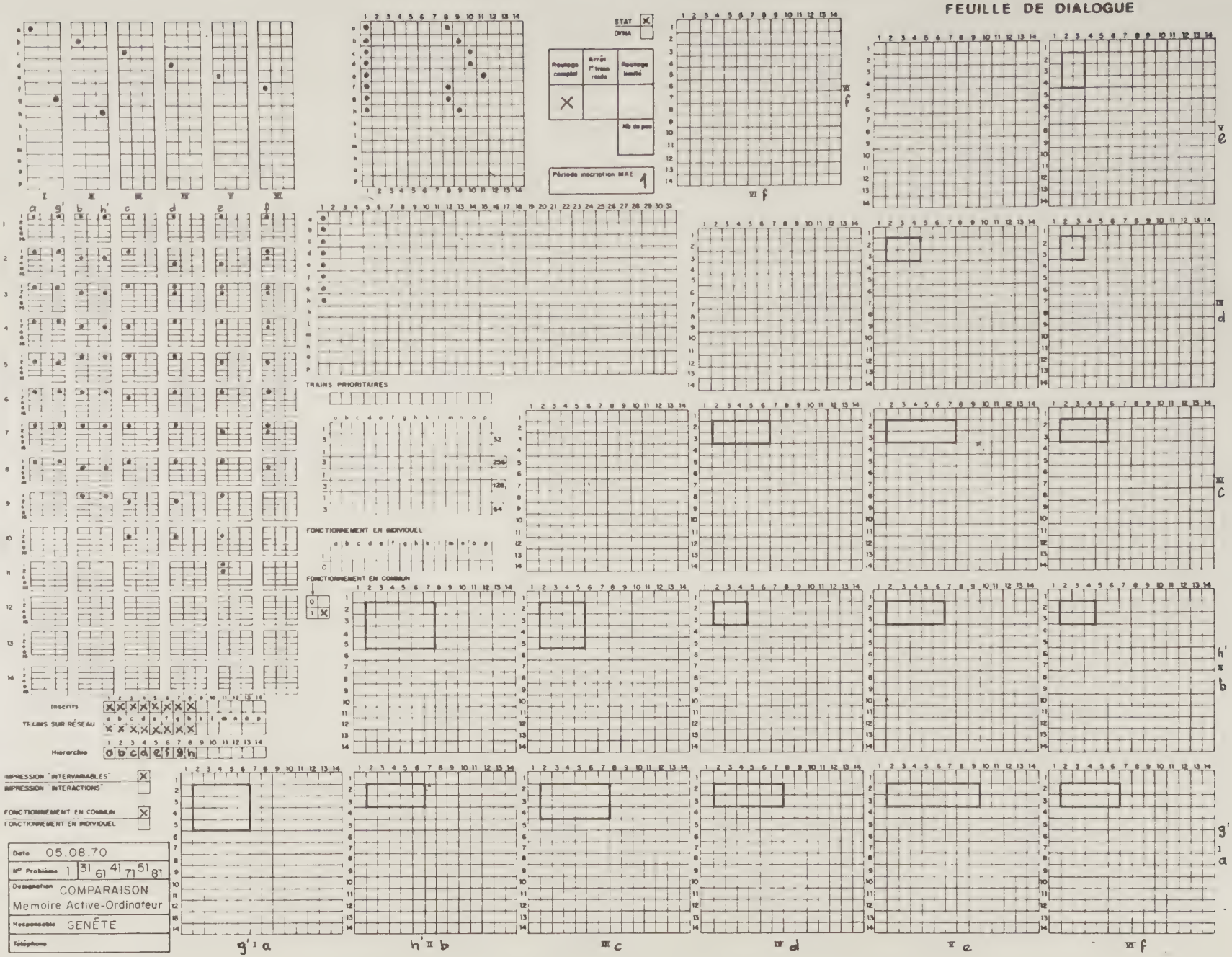

Légende =

| | |
|---|---|
| 7 | cantons réels |
| 8 | cantons fictifs |
| 3 | Pondération du canton fictif |

**Tableau 534 d**

71.04.16-2871/RK

Figure 534 f


FEUILLE DE DIALOGUE
STAT
DYNA
Routage complet
Arrêt 1ère train reçu
Routage limité
Nb de pas
Période inscription MAE 1
TRAINS PRIORITAIRES
FONCTIONNEMENT EN INDIVIDUEL
FONCTIONNEMENT EN COMMUN
Inscrits
TRAINS SUR RÉSEAU
Hiérarchie
IMPRESSION "INTERVARIABLES"
IMPRESSION "INTERACTIONS"
FONCTIONNEMENT EN COMMUN
FONCTIONNEMENT EN INDIVIDUEL
Date 05.08.70
N° Problème 1 31 61 41 71 51 81
Désignation COMPARAISON
Mémoire Active-Ordinateur
Responsable GENÊTE
Téléphone
g' I a
h' II b
III c
IV d
V e
VI f

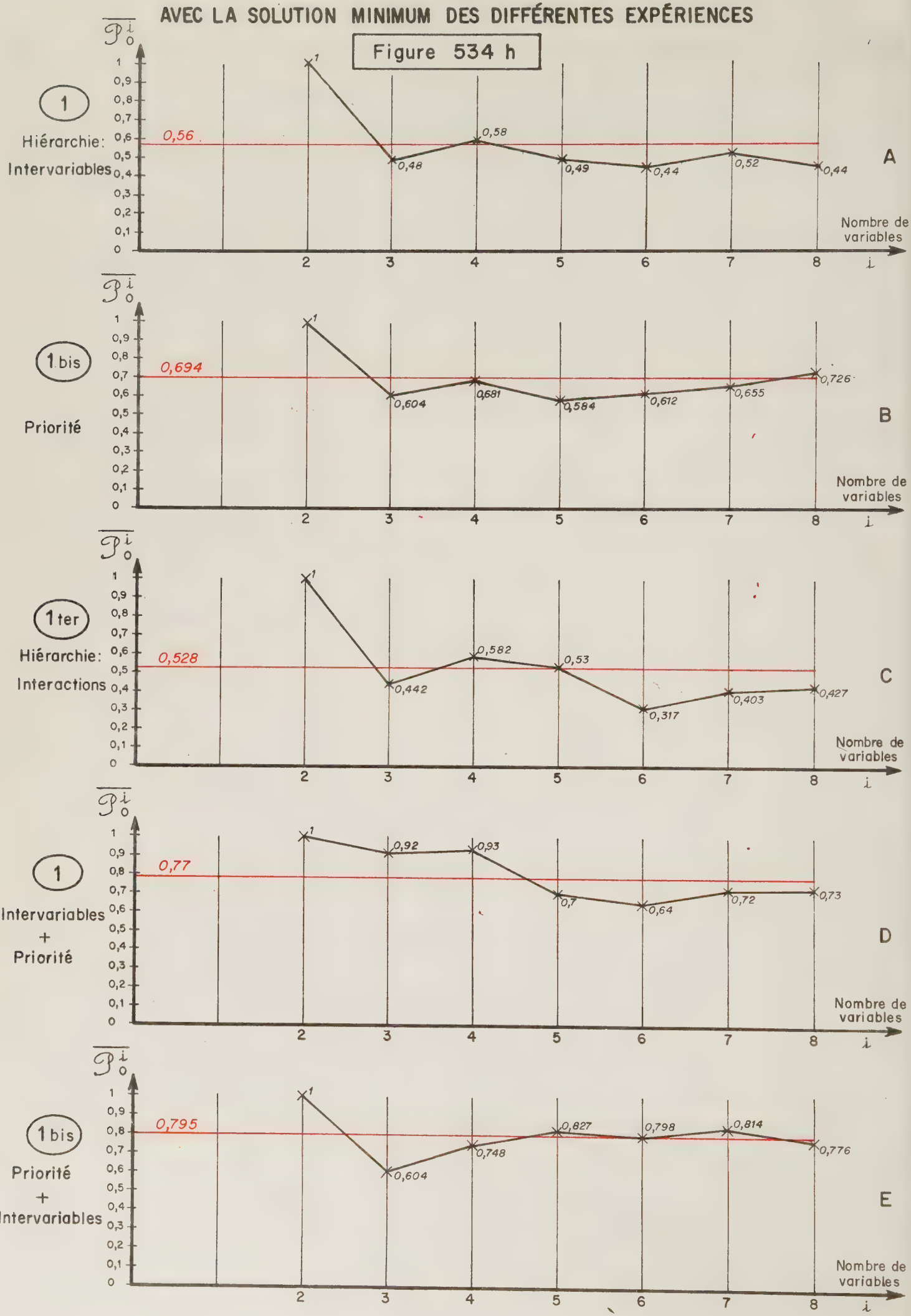
| Expériences | $P_o$ | No | Sans PRIO HIV a b c d e f g h HIA 1 1 1 1 1 1 1 1 $N^{ij}_m$ | Etude simple HIV | | HIA | | PRIO | | Etude 1 HIV + PRIO | | | | Etude 2 PRIO + HIV | | | | Etude 3 HIA + HIV | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | $N^{ij}_m$ | $n_b$ | $N^{ij}_m$ | $n_b$ | $N^{ij}_m$ | $n_b$ | $N^{ij}_m$ | $P_{o_2}$ | $N^{ij}_{bo}$ | $n_b$ | $N^{ij}_m$ | $P_{o_2}$ | $N^{ij}_{bo}$ | $n_b$ | $N^{ij}_m$ | $P_{o_2}$ | $N^{ij}_{bo}$ | $n_b$ |
| ex : 31 | 23 | 21 | 23 | 23 | 1 | 23 | 1 | 22 | 3 | 22 | 0,5 | | 4 | 22 | 0,5 | | 1 | 23 | 0 | | |
| ex : 32 | 26, 7 | 23 | 26 | 26 | 1 | 26 | 1 | 23 | 2 | 23 | 1 | 3 | | 23 | 1 | 2 | | 26 | 0,19 | | |
| ex : 33 | 31, 3 | 27 | 27 | 27 | 1 | 27 | 1 | 30 | 1 | 27 | 1 | 1 | | 30 | 0,302 | | 1 | 27 | 1 | 1 | |
| ex : 34 | 32, 7 | 31 | 31 | 31 | 1 | 31 | 1 | 33 | 1 | 31 | 1 | 1 | | 33 | 0,176 | | 1 | 31 | 1 | 1 | |
| ex : 35 | 34, 3 | 34 | 34 | 34 | 1 | 34 | 1 | 34 | 1 | 34 | 1 | 1 | | 34 | 1 | 1 | | 34 | 1 | 1 | |
| ex : 36 | 31, 3 | 29 | 32 | 32 | 1 | 32 | 1 | 29 | 3 | 29 | 1 | 3 | | 29 | 1 | 3 | | 32 | 0,538 | | |
| ex : 41 | 30, 8 | 26 | 29 | 29 | 1 | 29 | 1 | 27 | 3 | 27 | 0,78 | | 4 | 27 | 0,792 | | 3 | 29 | 0,375 | | |
| ex : 42 | 36, 5 | 31 | 31 | 31 | 1 | 31 | 2 | 32 | 2 | 31 | 1 | 1 | | 31 | 1 | 6 | | 31 | 1 | 2 | |
| ex : 43 | 38 | 33 | 33 | 33 | 1 | 33 | 1 | 35 | 1 | 33 | 1 | 1 | | 33 | 1 | 6 | | 33 | 1 | 1 | |
| ex : 44 | 40, 8 | 39 | 39 | 39 | 1 | 39 | 1 | 41 | 1 | 39 | 1 | 1 | | 41 | 0,111 | | 1 | 39 | 1 | | |
| ex : 45 | 39, 7 | 37 | 40 | 40 | 1 | 40 | 1 | 37 | 4 | 37 | 1 | 6 | | 37 | 1 | 4 | | 40 | 0,111 | 1 | |
| ex : 46 | 36, 2 | 31 | 35 | 35 | 1 | 35 | 1 | 32 | 3 | 32 | 0,81 | | 7 | 32 | 0,807 | | 3 | 35 | 0,23 | 1 | |
| ex : 51 | 41, 1 | 34 | 36 | 36 | 1 | 34 | 5 | 39 | 1 | 36 | 0,72 | | 1 | 37 | 0,577 | | 7 | 34 | 1 | | |
| ex : 52 | 43, 4 | 37 | 42 | 37 | 3 | 37 | 2 | 39 | 2 | 37 | 1 | 3 | | 37 | 1 | 7 | | 37 | 1 | 2 | |
| ex : 53 | 46, 2 | 41 | 45 | 45 | 1 | 45 | 1 | 43 | 1 | 43 | 0, 61 | | 3 | 41 | 1 | 7 | | 45 | 0,23 | | |
| ex : 54 | 46, 2 | 42 | 44 | 44 | 1 | 44 | 1 | 44 | 5 | 44 | 0,52 | | 1 | 42 | 1 | 7 | | 44 | 0,57 | | |
| ex : 55 | 45, 3 | 39 | 43 | 43 | 1 | 43 | 1 | 40 | 4 | 40 | 0,84 | | 7 | 40 | 0,84 | | 4 | 43 | 0,365 | | |
| ex : 56 | 41, 6 | 35 | 41 | 41 | 1 | 41 | 1 | 38 | 3 | 38 | 0,55 | | 5 | 38 | 0,545 | | 6 | 41 | 0,017 | | |
| ex : 61 | 48, 5 | 40 | 44 | 44 | 1 | 42 | 3 | 44 | 3 | 42 | 0, 77 | | 4 | 42 | 0,765 | | 8 | 42 | 0,765 | | |
| ex : 62 | 51, 7 | 45 | 48 | 50 | 1 | 50 | 1 | 46 | 2 | 47 | 0,70 | | 4 | 45 | 1 | 8 | | 50 | 0,254 | | |
| ex : 63 | 52, 3 | 46 | 51 | 51 | 1 | 51 | 1 | 49 | 1 | 47 | 0,85 | | 3 | 46 | 1 | 9 | | 51 | 0,23 | | |
| ex : 64 | 52 | 44 | 47 | 47 | 1 | 47 | 1 | 47 | 5 | 47 | 0,66 | | 1 | 45 | 0,875 | | 8 | 47 | 0,625 | | |
| ex : 65 | 50, 7 | 42 | 49 | 49 | 1 | 49 | 1 | 46 | 4 | 46 | 0,43 | | 5 | 46 | 0,54 | | 4 | 49 | 0,195 | | |
| ex : 66 | 47, 7 | 40 | 48 | 48 | 2 | 49 | 1 | 43 | 6 | 45 | 0,35 | | 5 | 43 | 0,61 | | 6 | 48 | 0,039 | | |
| ex : 71 | 55, 6 | 44 | 47 | 47 | 1 | 47 | 1 | 49 | 1 | 47 | 0,74 | | 1 | 47 | 0,74 | | 10 | 47 | 0,74 | | |
| ex : 72 | 57, 8 | 51 | 55 | 54 | 2 | 54 | 2 | 53 | 2 | 52 | 1 | | 2 | 52 | 0,853 | | 9 | 54 | 0,558 | | |
| ex : 73 | 59, 3 | 53 | 58 | 60 | 1 | 60 | 1 | 57 | 1 | 57 | 0,36 | | 3 | 53 | 1 | | 9 | 60 | 0,11 | | |
| ex : 74 | 59, 8 | 51 | 54 | 54 | 1 | 54 | 1 | 52 | 5 | 52 | 0,89 | | 9 | 52 | 0,886 | | 5 | 54 | 0,66 | | |
| ex : 75 | 60, 8 | 50 | 57 | 57 | 1 | 57 | 1 | 54 | 4 | 54 | 0,58 | | 11 | 54 | 0,63 | | 4 | 57 | 0,352 | | |
| ex : 76 | 56 | 47 | 54 | 53 | 2 | 54 | 1 | 49 | 6 | 49 | 0, 78 | | 5 | 49 | 0, 776 | | 6 | 53 | 0, 33 | | |
| ex : 81 | 59, 7 | 50 | 51 | 51 | 1 | 51 | 1 | 53 | 1 | 51 | 0,73 | | 1 | 51 | 0,896 | | 10 | 51 | 0,896 | | |
| ex : 82 | 64, 6 | 56 | 64 | 62 | 2 | 62 | 4 | 58 | 1 | 58 | 0,77 | | 7 | 57 | 0,883 | | 10 | 62 | 0, 31 | | |
| ex : 83 | 66, 6 | 58 | 65 | 67 | 1 | 67 | 1 | 60 | 1 | 60 | 0,77 | | 3 | 60 | 0,767 | | 1 | 67 | 0,046 | | |
| ex : 84 | 69, 4 | 59 | 62 | 62 | 1 | 62 | 1 | 62 | 2 | 62 | 0,71 | | 1 | 62 | 0,712 | | 2 | 62 | 0, 71 | | |
| ex : 85 | 68, 4 | 56 | 63 | 63 | 1 | 63 | 1 | 60 | 4 | 60 | 0,68 | | 5 | 60 | 0,677 | | 4 | 63 | 0,428 | | |
| ex : 86 | 64, 9 | 54 | 62 | 61 | 2 | 62 | 1 | 57 | 3 | 57 | 0, 73 | | 4 | 57 | 0,725 | | 3 | 61 | 0,358 | | |

# Tableau 5.34g

| Etude 4 HIV + HIA | | | Etude 5 PRIO + HIA | | | | Etude 6 HIA + PRIO | | | | Prétraitement HIV + PRIO | | | | Distance de l'optimum | Niveau de priorité | Prétraitement HIV | | Formules |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\rho_{o_2}$ | $N^{ij}_{bo}$ | $n_b$ | $N^{ij}_m$ | $\rho_{o_2}$ | $N^{ij}_{bo}$ | $n_b$ | $N^{ij}_m$ | $\rho_{o_2}$ | $N^{ij}_{bo}$ | $n_b$ | $N^{ij}_m$ | $\rho_{o_2}$ | $N^{ij}_{bo}$ | $n_b$ | | | $N^{ij}_m$ | Hiérarchie | |
| 0 | | 1 | 22 | 0,5 | | 3 | 22 | 0 | | 3 | 21 | 1 | 4 | | | 2 | 23 | a c b | |
| 0,188 | | 1 | 23 | 1 | 4 | | 23 | 1 | 2 | | 23 | 1 | 2 | | | 1 | 26 | c b d | |
| 1 | 1 | | 30 | 0,302 | | 1 | 30 | 0,048 | | 1 | 27 | 1 | 1 | | | 0 | 27 | c e d | |
| 1 | | 1 | 33 | 0,176 | | 1 | 33 | 0,176 | | 1 | 31 | 1 | 1 | | | 0 | 31 | e f d | $\mu^{ij}_{om}\% = \frac{M^{ij}_{ma} - N^{ij}_o}{N^{ij}_o} \times 100$ |
| 1 | 1 | | 34 | 1 | 1 | | 34 | 1 | 1 | | 34 | 1 | 1 | | | 0 | 34 | e f g | |
| 0,32 | | 1 | 29 | 1 | 3 | | 29 | 1 | 3 | | 29 | 1 | 2 | | | 1 | 32 | h g f | |
| 0,374 | | 1 | 27 | 0,79 | | 3 | 27 | 0,79 | | 3 | 26 | 1 | 7 | | | 2 | 29 | a c b d | |
| 1 | 1 | | 32 | 0,815 | | 2 | 32 | 0,82 | | 2 | 31 | 1 | 1 | | | 0 | 31 | c e b d | |
| 1 | 1 | | 33 | 1 | 2 | | 35 | 0,6 | | 1 | 33 | 1 | 1 | | | 0 | 33 | c e f d | $\rho^{ij}_{o_1} = \frac{M^{ij}_o - M^{ij}_{ma}}{M^{ij}_o - N^{ij}_o}$ |
| 1 | 1 | | 41 | 0,11 | | 1 | 41 | 0,111 | | 1 | 39 | 1 | 1 | | | 0 | 39 | e f g d | |
| 0,111 | | 1 | 37 | 1 | 4 | | 37 | 1 | 4 | | 37 | 1 | 5 | | | 1 | 40 | h e f g | |
| 0,23 | | 1 | 32 | 0,84 | | 3 | 32 | 0,806 | 3 | | 32 | 0,807 | | 5 | 1 p | 1 | 35 | a h g f | |
| 1 | 5 | | 37 | 0,575 | | 2 | 37 | 0,578 | | 1 | 34 | 1 | 5 | | | 2 | 36 | a c e b d | $\rho^{ij}_{o_2} = \frac{M^{ij}_o - N^{ij}_m}{M^{ij}_o - N^{ij}_o}$ |
| 1 | 2 | | 37 | 1 | 3 | | 39 | 0,687 | | 2 | 37 | 1 | 1 | | | 0 | 37 | c e b f d | |
| 0,23 | | 1 | 41 | 1 | 2 | | 43 | 0,615 | | 1 | 41 | 1 | 2 | | | 1 | 45 | c e f g d | |
| 0,524 | | 1 | 42 | 1 | 6 | | 44 | 0,524 | | 1 | 42 | 1 | 6 | | | 1 | 44 | h e f g d | |
| 0,365 | | 1 | 40 | 0,84 | | 4 | 40 | 0,84 | 4 | | 40 | 0,842 | | 6 | 1 p | 1 | 43 | a h e f g | |
| 0,090 | | 1 | 38 | 0,545 | | 3 | 38 | 0,54 | | 3 | 36 | 0,848 | | 8 | 1 p | 2 | 41 | a h g f b | $\varepsilon_{\mu\%} = \frac{M^{ij}_o - N^{ij}_o}{N^{ij}_o} \times 100$ |
| 0,715 | 3 | | 44 | 0,53 | | 3 | 44 | 0,53 | | 2 | 40 | 1 | 4 | | | 2 | 45 | a c e f b d | |
| 0,252 | | 1 | 45 | 1 | 3 | | 46 | 0,85 | | 2 | 45 | 1 | 3 | | | 1 | 50 | c e g b f d | |
| 0,206 | | 1 | 46 | 1 | 2 | | 49 | 0,525 | | 1 | 46 | 1 | 1 | | | 1 | 51 | c h e f g d | $\varepsilon_{m\%} = \frac{N^{ij}_m - N^{ij}_o}{N^{ij}_o} \times 100$ |
| 0,625 | | 1 | 47 | 0,625 | | 5 | 47 | 0,625 | | 5 | 45 | 0,875 | | 7 | 1 p | 1 | 47 | a h e f g d | |
| 0,199 | | 1 | 46 | 0,54 | | 4 | 46 | 0,54 | | 4 | 43 | 0,885 | | 12 | 1 p | 2 | 49 | a h e f g b | |
| 0,039 | | 2 | 43 | 0,61 | | 6 | 43 | 0,61 | | 6 | 42 | 0,74 | | 9 | 2 p | 2 | 47 | a c h g b f | |
| 0,74 | | 1 | 49 | 0,57 | | 1 | 49 | 0,568 | | 1 | 45 | 0,903 | | 4 | 1 p | 2 | 48 | a g c e f b d | |
| 0,558 | | 2 | 53 | 0,705 | | 2 | 53 | 0,705 | | 2 | 52 | 0,852 | | 3 | 1 p | 1 | 54 | c e g b h f d | |
| 0,111 | | 1 | 53 | 1 | 2 | | 57 | 0,365 | | 1 | 53 | 1 | 2 | | | 1 | 60 | c a h e f g d | |
| 0,659 | | 1 | 52 | 0,885 | | 5 | 52 | 0,885 | | 5 | 52 | 0,886 | | 3 | 1 p | 1 | 54 | a h e f g d b | |
| 0,352 | | 1 | 54 | 0,63 | | 4 | 54 | 0,63 | | 4 | 51 | 0,908 | | 14 | 1 p | 2 | 58 | a h e c g b f | |
| 0,33 | | 2 | 49 | 0,778 | | 6 | 49 | 0,78 | | 6 | 47 | 1 | 9 | | | 2 | 53 | a c h d g b f | |
| 0,896 | | 1 | 53 | 0,69 | | 1 | 53 | 0,61 | | 1 | 50 | 1 | 4 | | | 2 | 54 | a c g e b f d h | |
| 0,31 | | 2 | 58 | 0,767 | | 1 | 59 | 0,65 | | 1 | 56 | 1 | 2 | | | 1 | 62 | c a e g b f h d | |
| 0,035 | | 1 | 60 | 0,765 | | 1 | 60 | 0,77 | | 1 | 59 | 0,883 | | 12 | 1 p | 2 | 67 | c a h e f g d b | |
| 0,712 | | 1 | 62 | 0,71 | | 2 | 62 | 0,71 | | 2 | 60 | 0,904 | | 9 | 1 p | 1 | 62 | a h e c f g d b | |
| 0,435 | | 1 | 60 | 0,678 | | 4 | 60 | 0,68 | | 4 | 57 | 0,919 | | 16 | 1 p | 2 | 63 | a h e c d f g b | |
| 0,358 | | 2 | 57 | 0,725 | | 3 | 57 | 0,725 | | 6 | 54 | 1 | 10 | | | 2 | 61 | a c h d g b e f | |

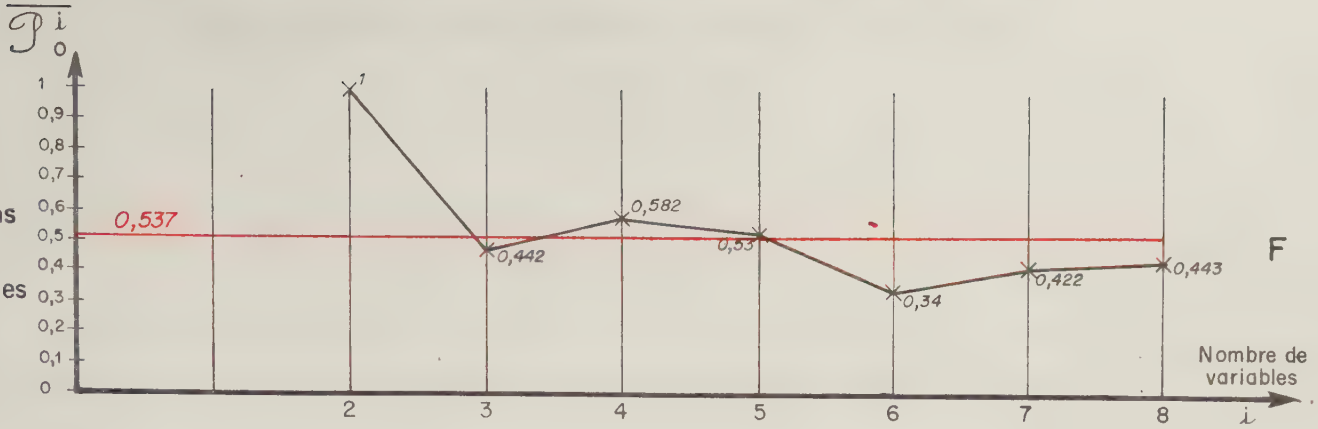
# GRAPHIQUE COMPARATIF DU POUVOIR OPTIMISANT MOYEN $\overline{P_{i_0}}$ CALCULÉ AVEC LA SOLUTION MINIMUM DES DIFFÉRENTES EXPÉRIENCES

Figure 534 h



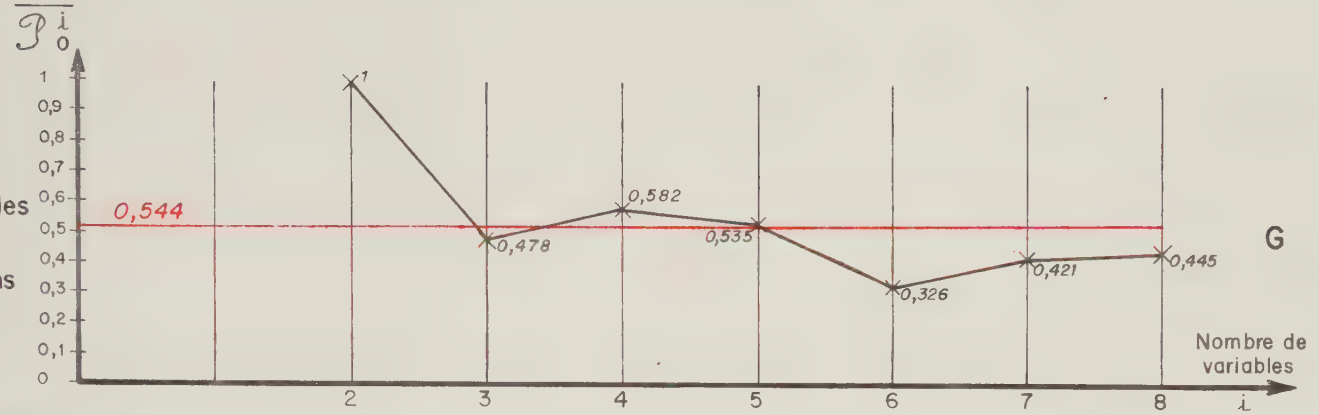
1 ter

Interactions + Intervariables



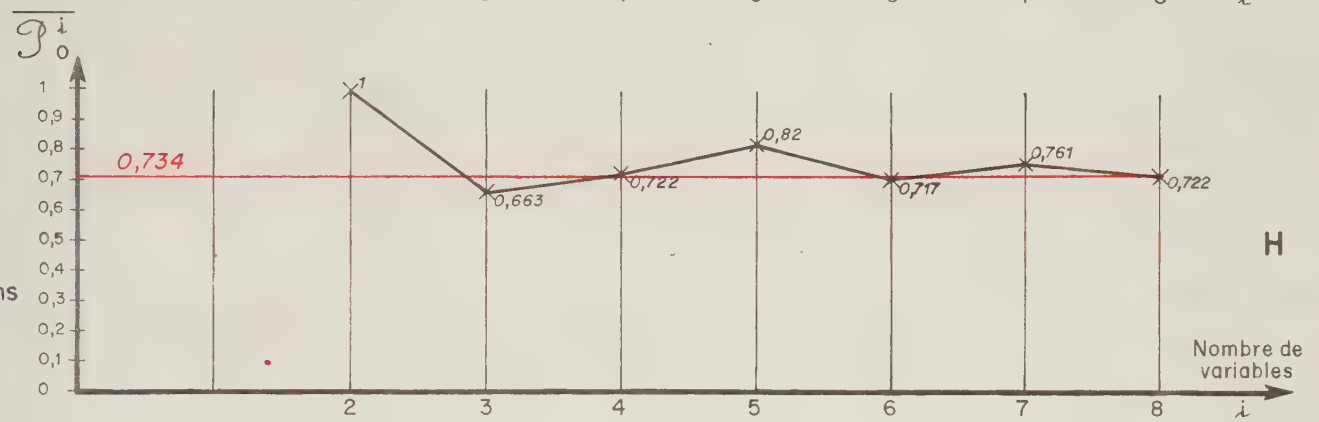

1 quater

Intervariables + Interactions



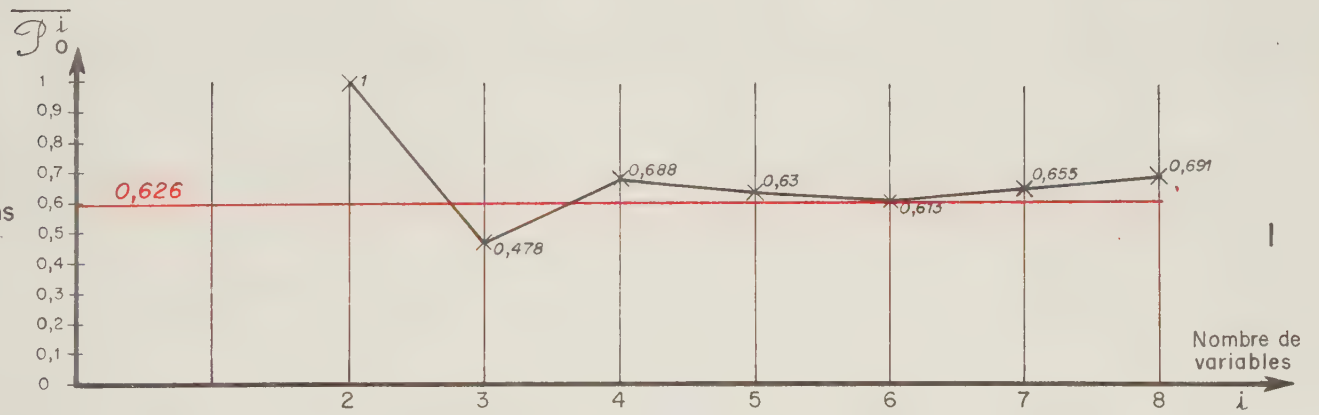

1 quinte

Priorité + Interactions

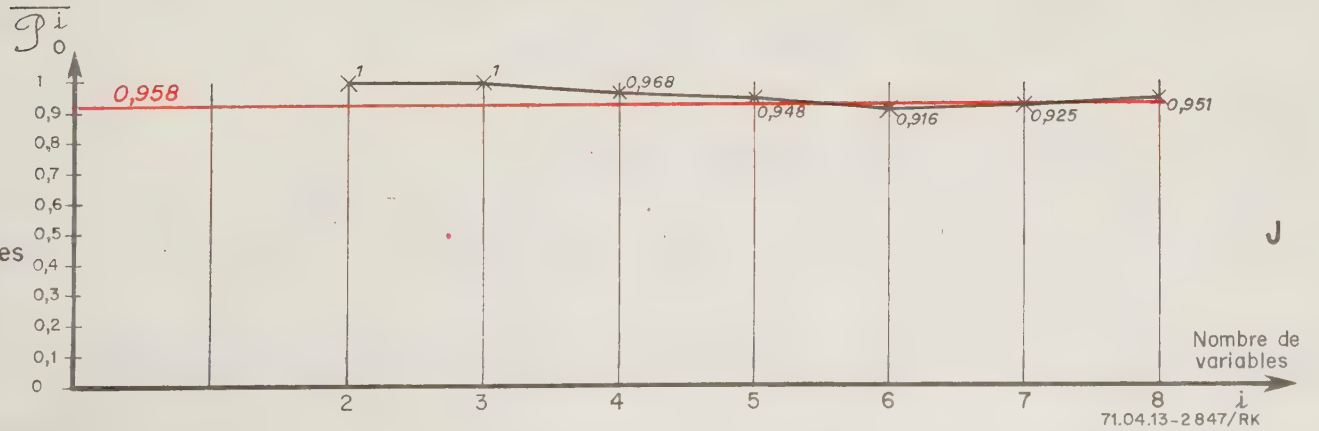



1 sexto

Interactions + Priorité



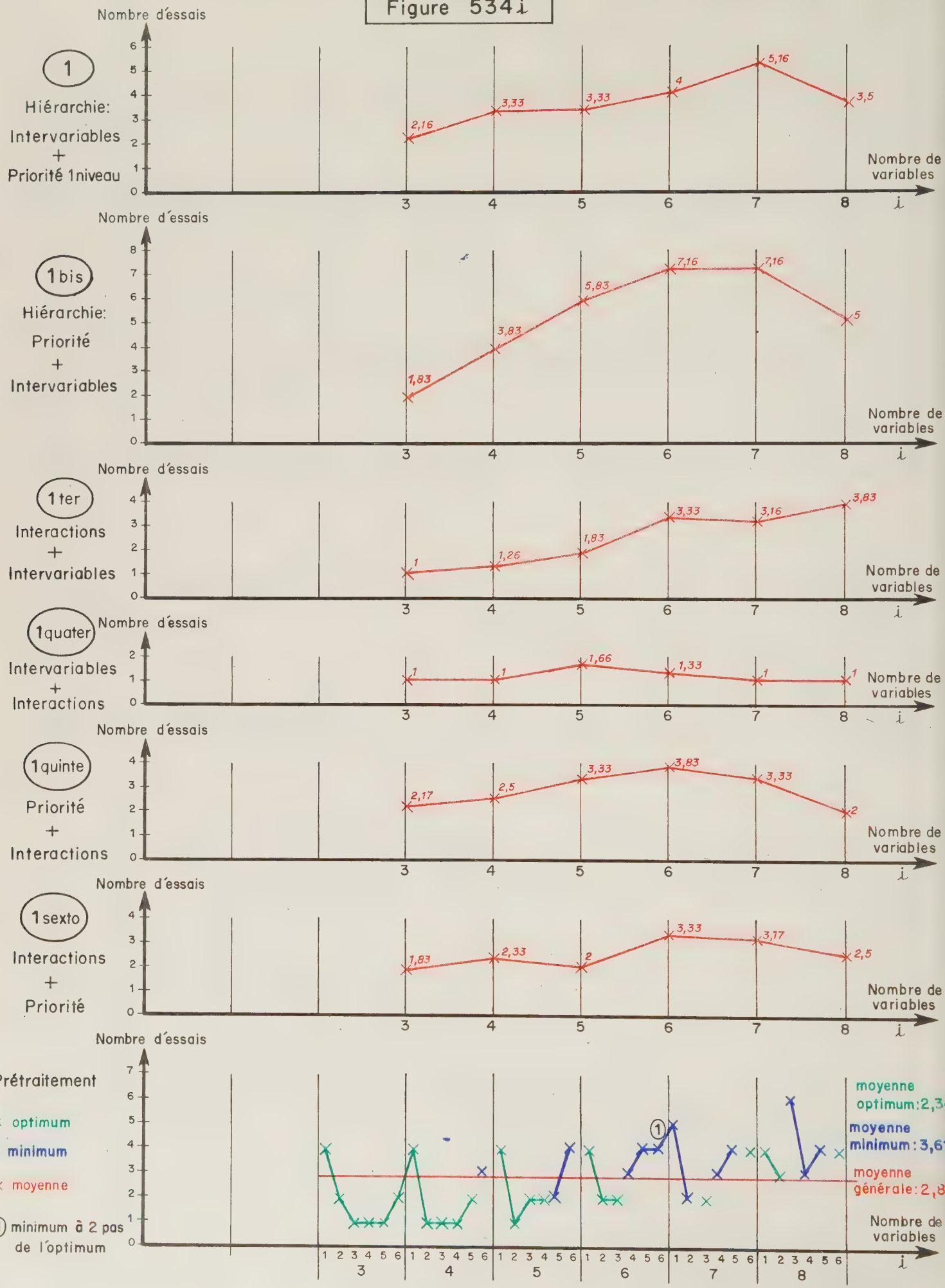

étraitement Intervariables + Priorité




71.04.13-2847/RK

# COMPARAISON DU NOMBRE D'ESSAIS POUR QUE LA M.A. DONNE LA SOLUTION MINIMALE AVEC 2 HIÉRARCHIES

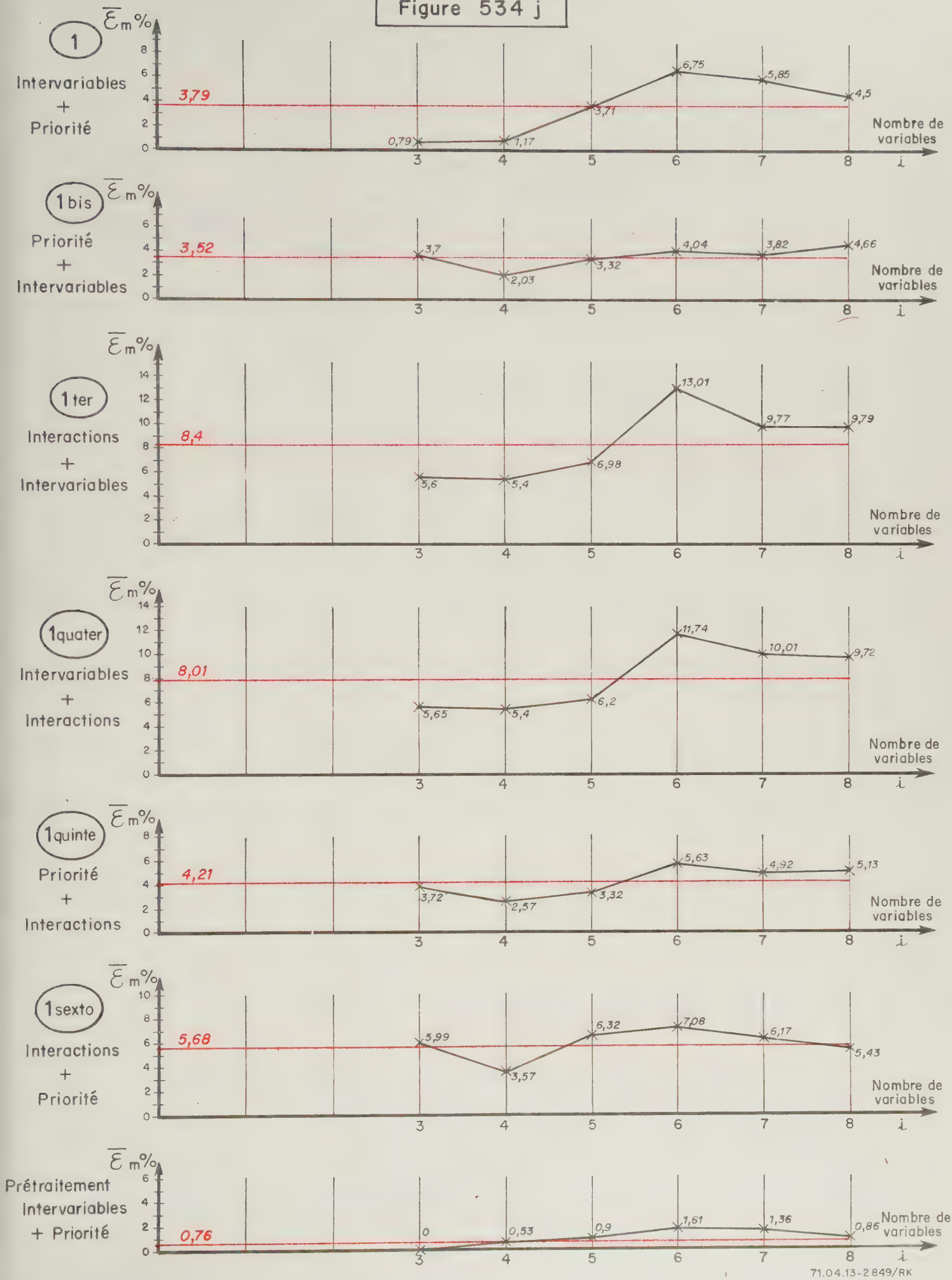
Figure 534i




71.04.13-2848/RK

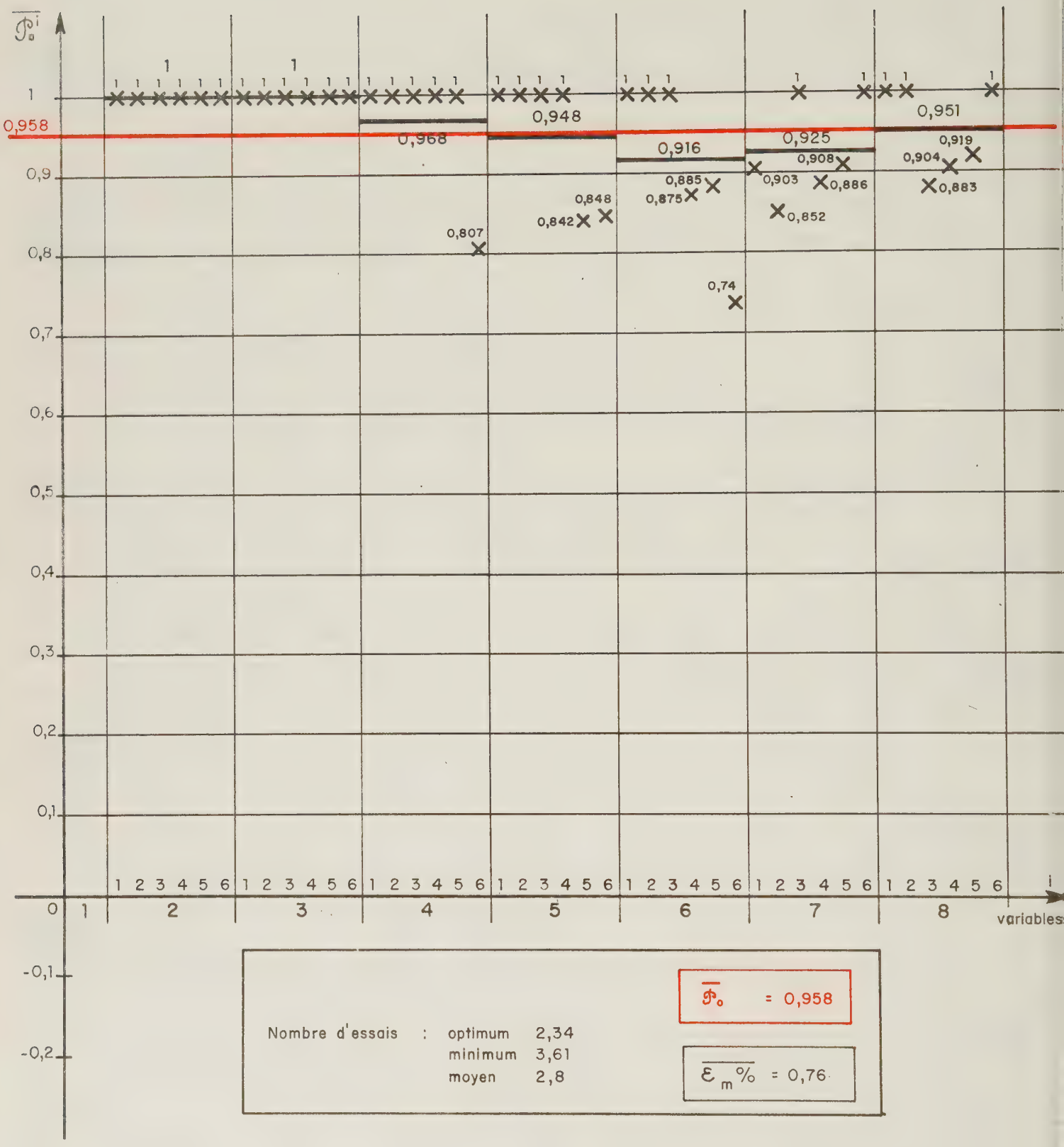
# ÉCART EN POURCENTAGE ENTRE LA SOLUTION MINIMUM ET LA SOLUTION OPTIMALE

Figure 534 j




71.04.13-2849/RK

# POUVOIR OPTIMISANT MOYEN




Nombre d'essais : optimum 2,34
minimum 3,61
moyen 2,8

$\overline{\mathcal{P}_o}$ = 0,958

$\overline{\varepsilon_m\,\%}$ = 0,76

Figure 5435 a

# CHAPITRE 6

## Problèmes d'ordonnancement réels traités sur la "Mémoire Active"

Figure 61a

voir pages suivantes

II

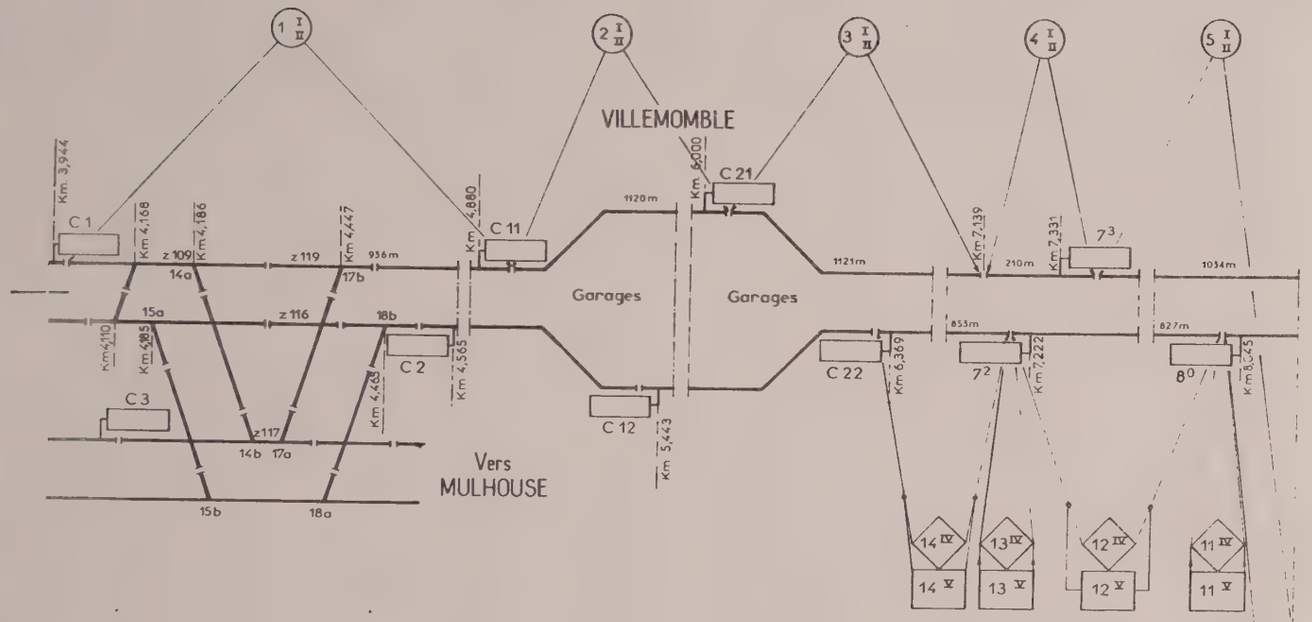



Figure 61a

RACCORDEMENT DE GAGNY

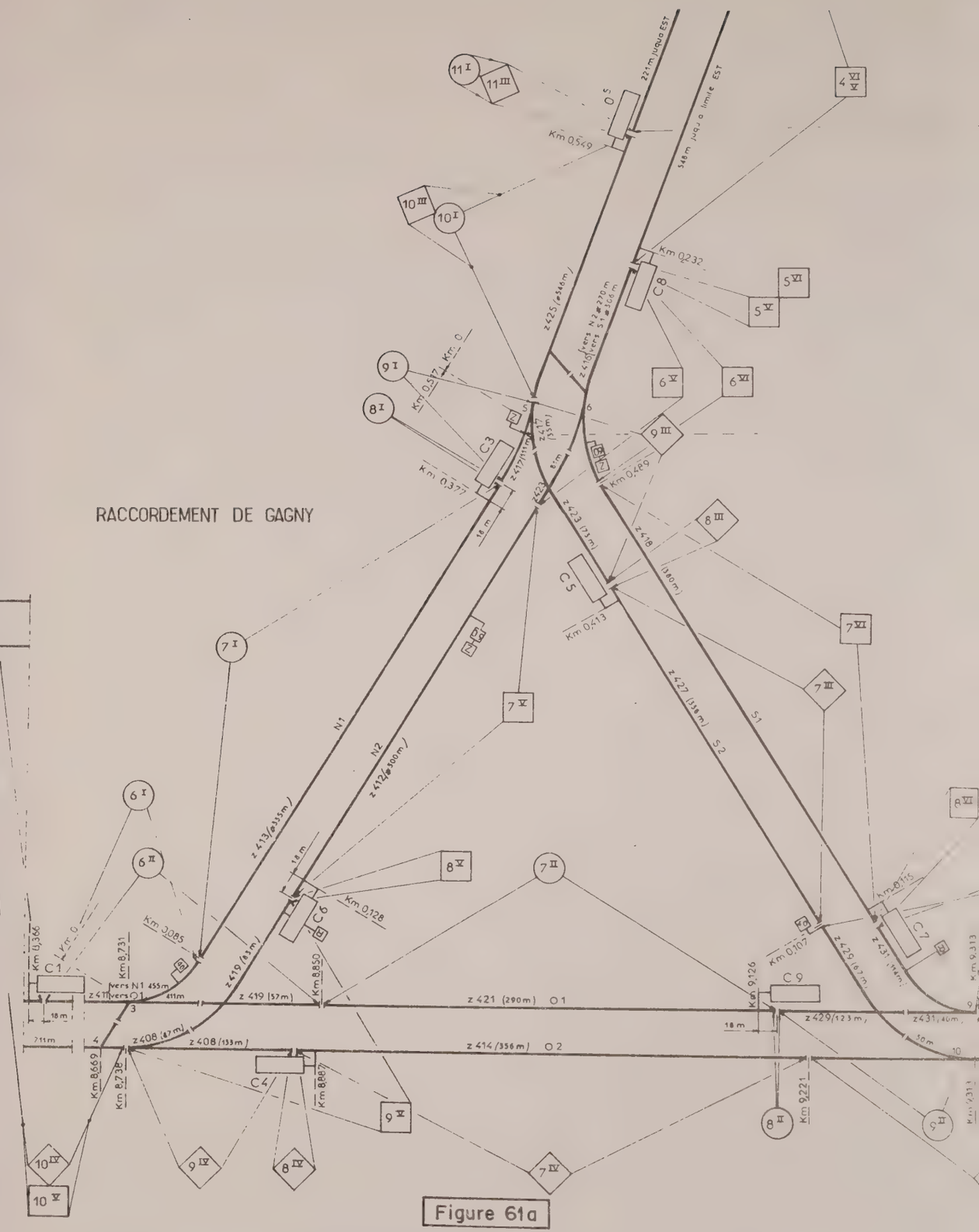



Figure 61a

CHENAY-GAGNY

CHELLES-GOURNAY

Vers Faisceau A 1

Vers Faisceau V

VAIRES

Limite région EST et NORD (Km Est 14,950)

NEUILLY-SUR-MARNE

BRY-SUR-MARNE

Figure 61a

Figure 61a

71.03.01-2690/RK

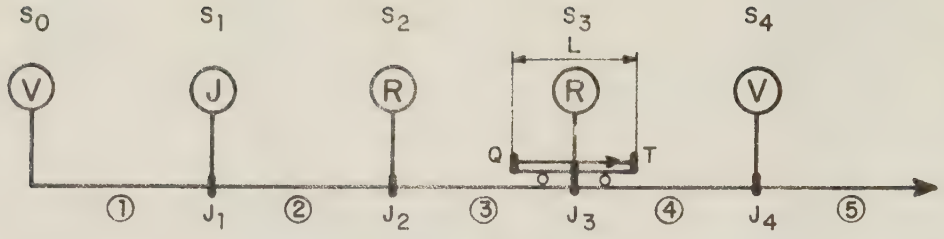



Figure 611 b 1

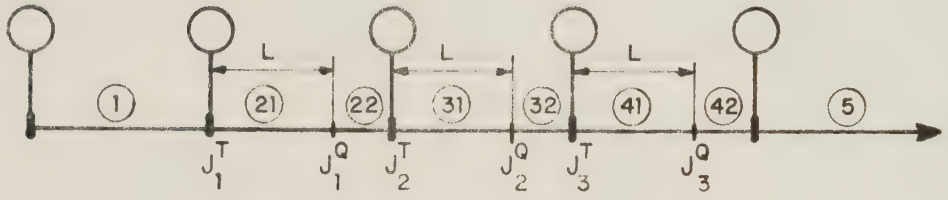



Figure 611 b 2

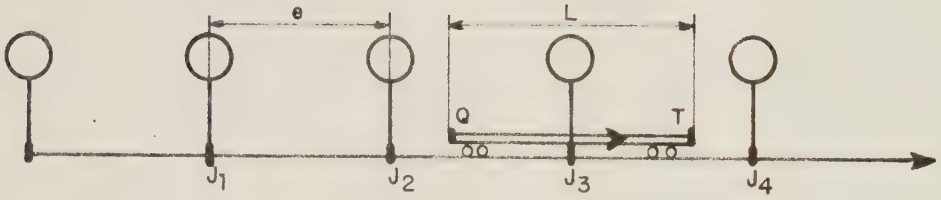



Figure 611 c 1

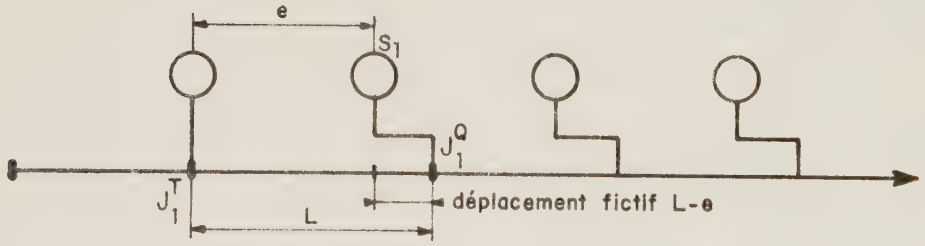



Figure 611 c 2

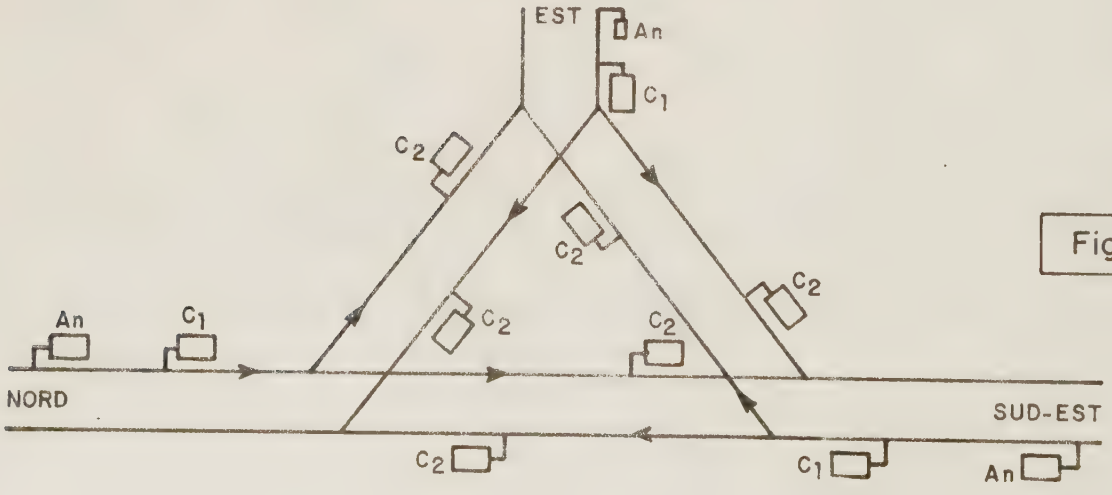



Figure 611 d

# TABLEAU DES CONFLITS

( Gagny )

| I NE | II NS | III SE | IV SN | V EN |
|---|---|---|---|---|
| Dg II(NS) | | | | |
| Cg III(SE) | Cs III(SE) | | | |
| O IV(SN) | O IV (SN) | Dg IV(SN) | | |
| O V(EN) | Cs V (EN) | Cs V(EN) | Cg V(EN) | |
| O VI(EN) | Cg VI(ES) | O VI(ES) | O VI(ES) | Dg VI(ES) |

Dg: Divergence - Cg: Convergence - Cs: Cisaillement - O: Pas d'incompatibilité

Figure 612 a

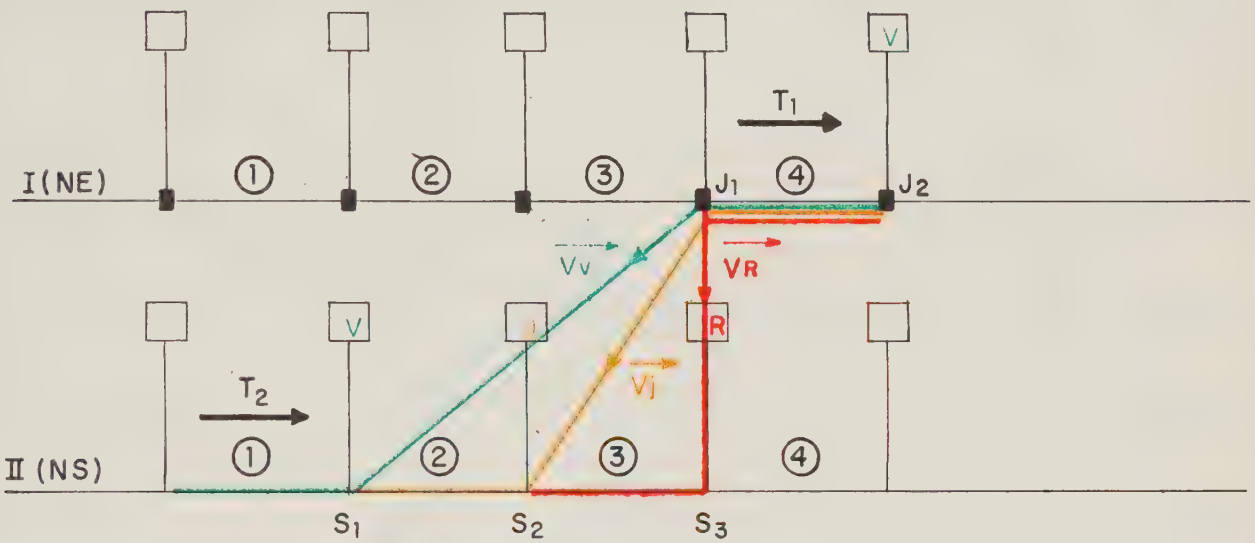



Figure 612 b

Figure 612 b1

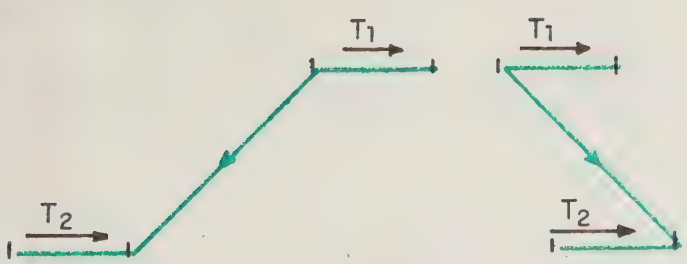



Figure 612b2

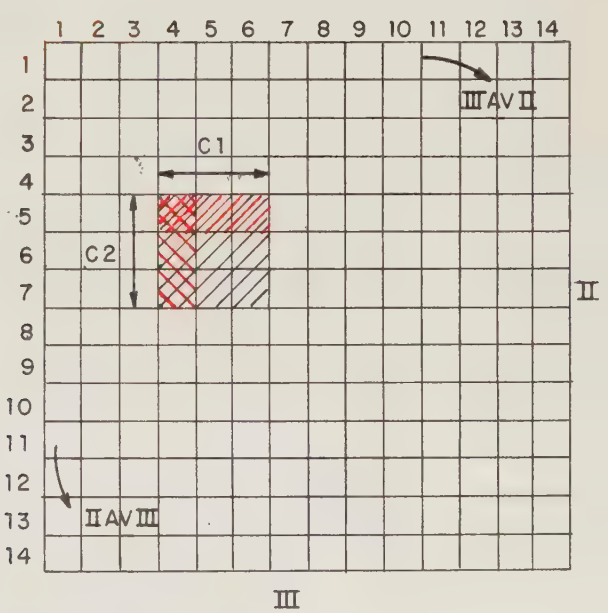
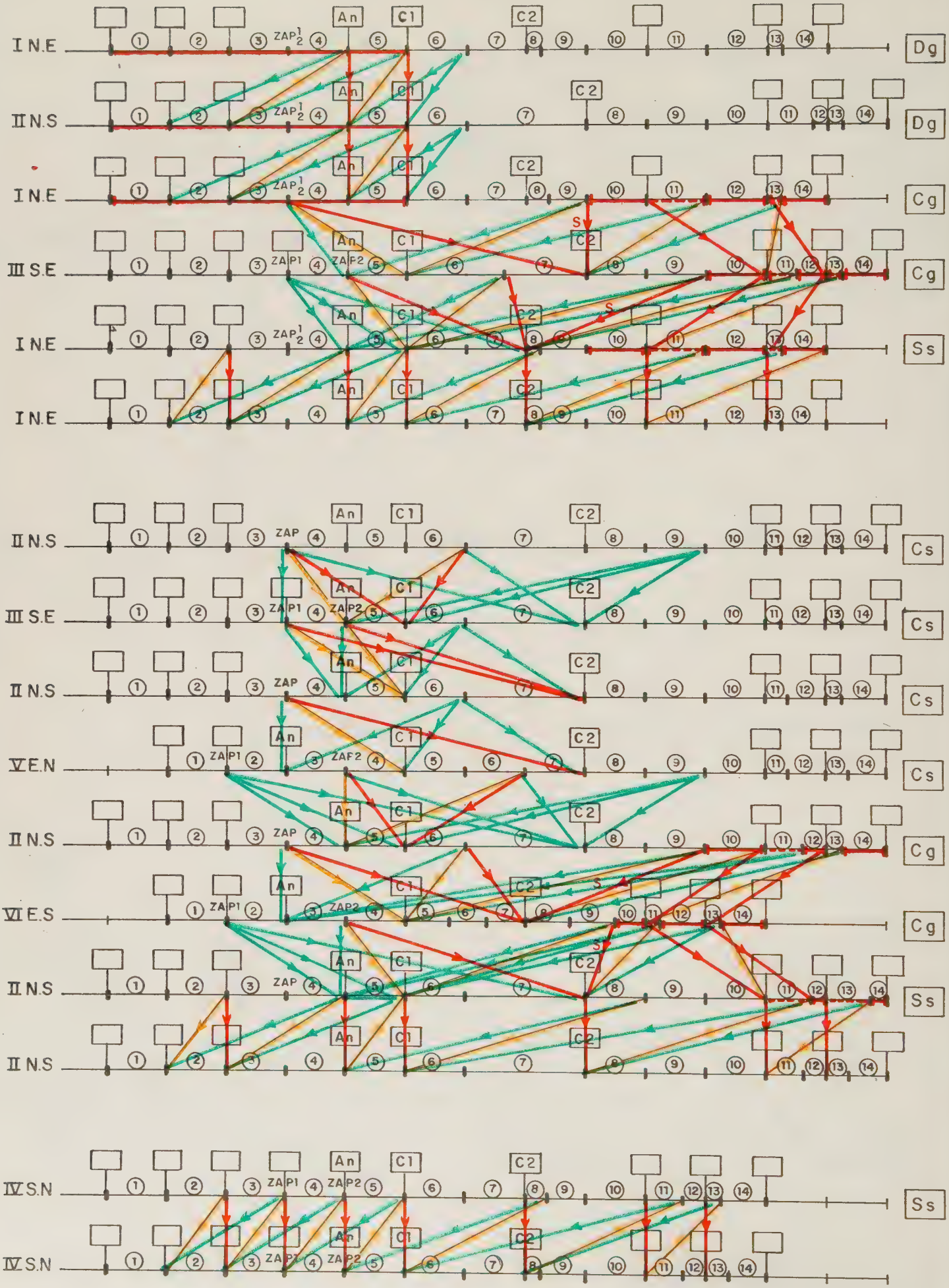



Figure 615 a

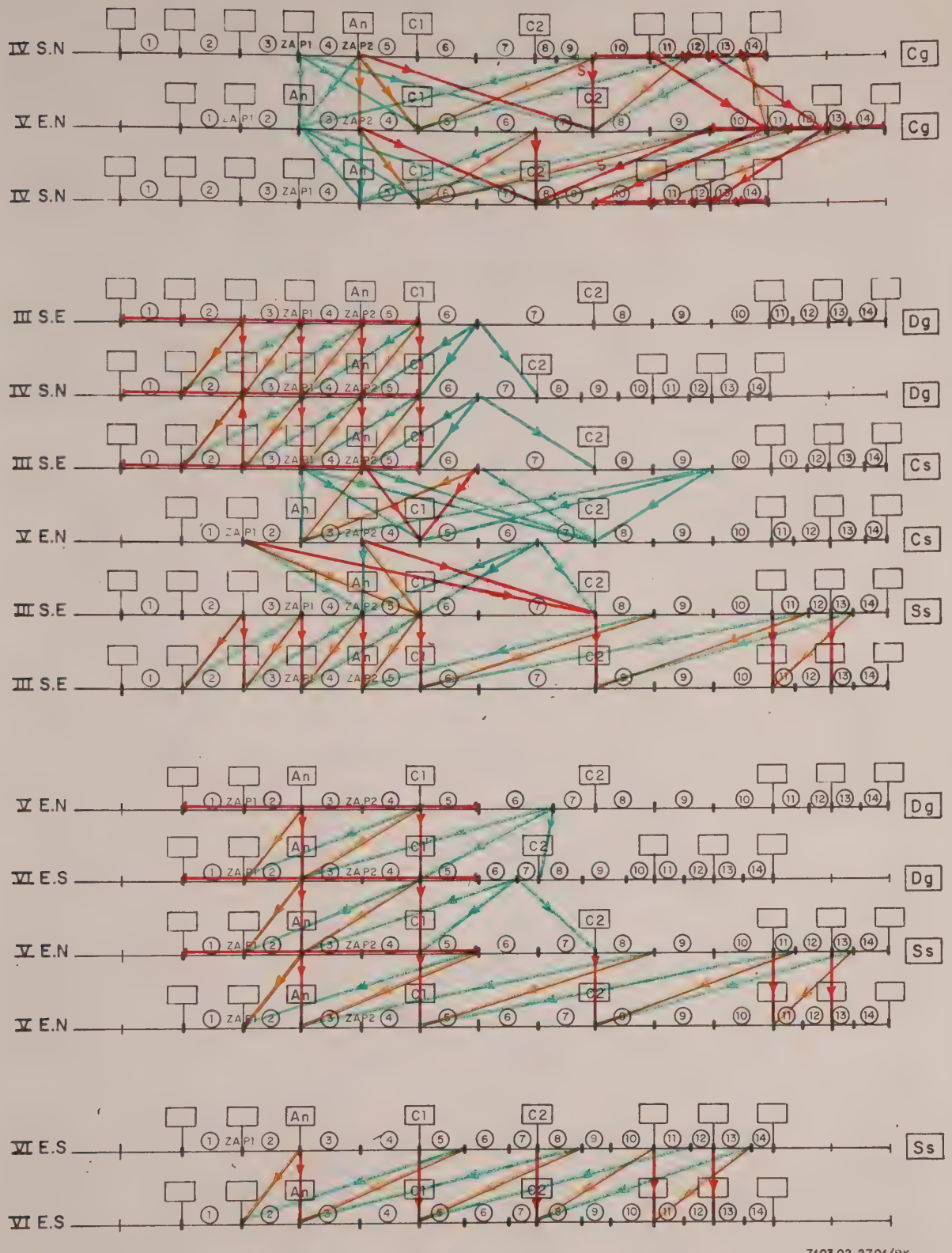
# GRAPHE COLORÉ

Figure 612 C1



GRAPHE COLORÉ

Figure 612 C2




71.03.02-2701/RK

FEUILLE DE DIALOGUE

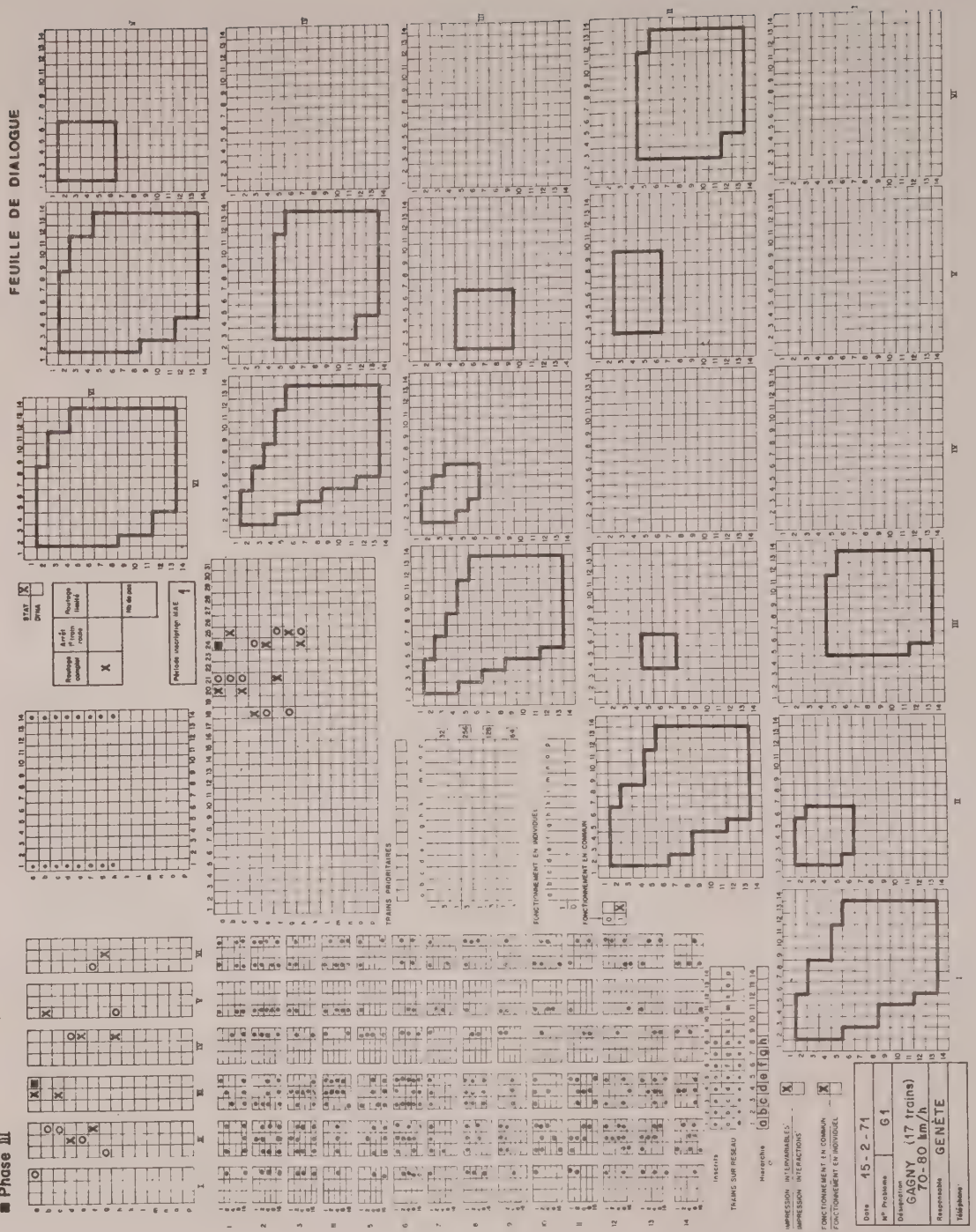
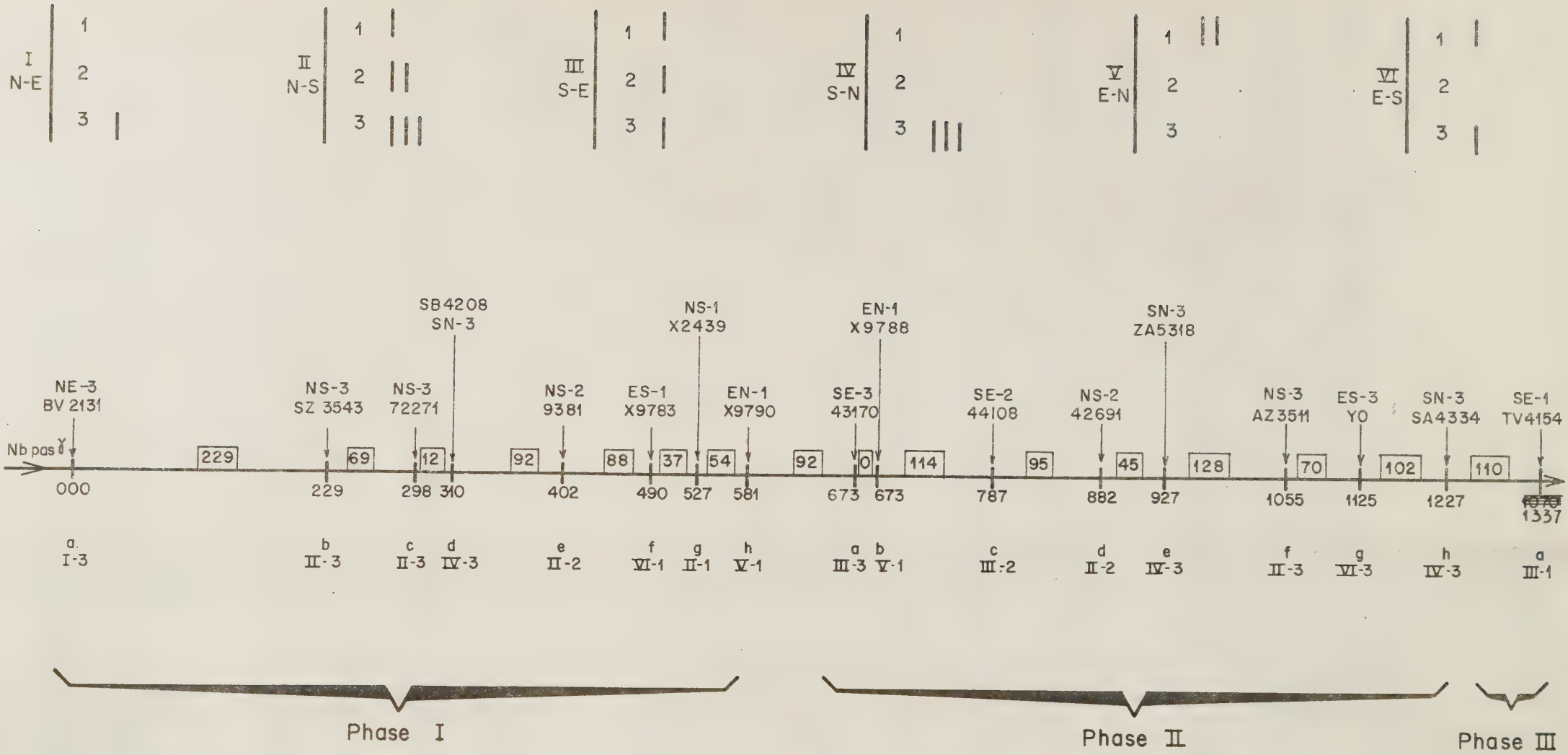



Figure 615 b

71.03.01-2691/RK

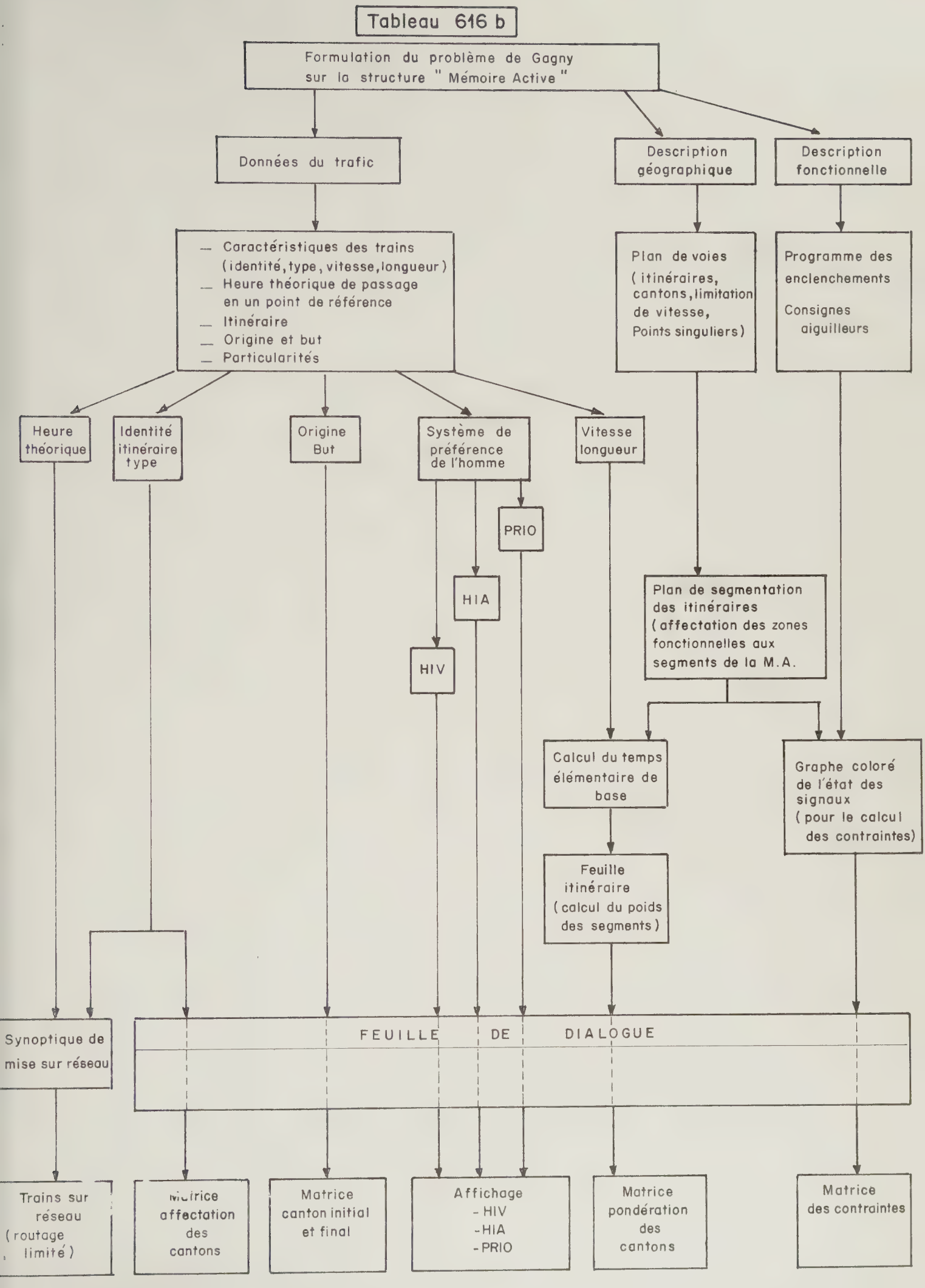



SYNOPTIQUE DE MISE SUR RÉSEAU

Figure 616 a

71.04.20-2926/RK

Tableau 616 b




71.02.24-2684/RK

# CHAPITRE 7

## Projets d'avenir

Entrée des données

- Nombre de variables
- Nombre de cantons / variable
- Situation de départ SD
- Situation d' arrivée SA
- Contraintes entre variables (prises deux à deux)
- Pondération des cantons
- Hiérarchie HIV – HIA

Exploration du CAS ij

Mémorisation de : $N\beta j1, N\beta j0, N\beta i4, N\beta i0$ dans les C.V.A.

A-t'on exploré tous les C.A.S. ? — non → C.A.S. i+1 , j (C.A.S. suivant)

oui

Traitement des résultats d'exploration dans les C.V.A. – Définition de $N\beta$ et du système d'action Si

Si (Si+1)

Si est-il cohérent ? — non → Majoration de + 1 ($N\beta$+1)

oui

Lever des ambiguïtés sur les actions doubles par interrogation ou détermination de H.I.V. et H.I.A.

Pas $\gamma$ cohérent défini ? — non

oui

Réalisation de ce pas $\gamma$.

La nouvelle situation est alors considérée comme SD

A-t'on atteint S.A. ? — non

oui

La stratégie est complètement définie

Exploration CAS

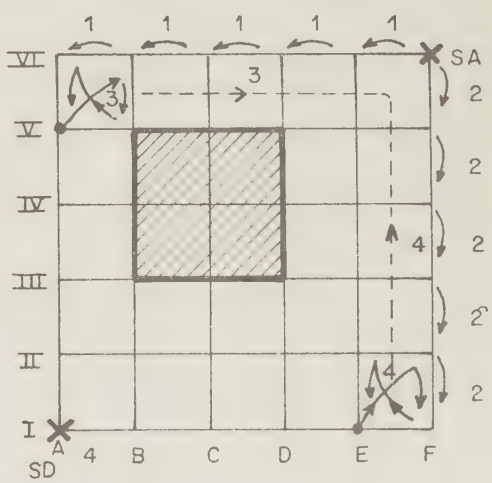



Fig. 712 a

71.04.19.2900/RK

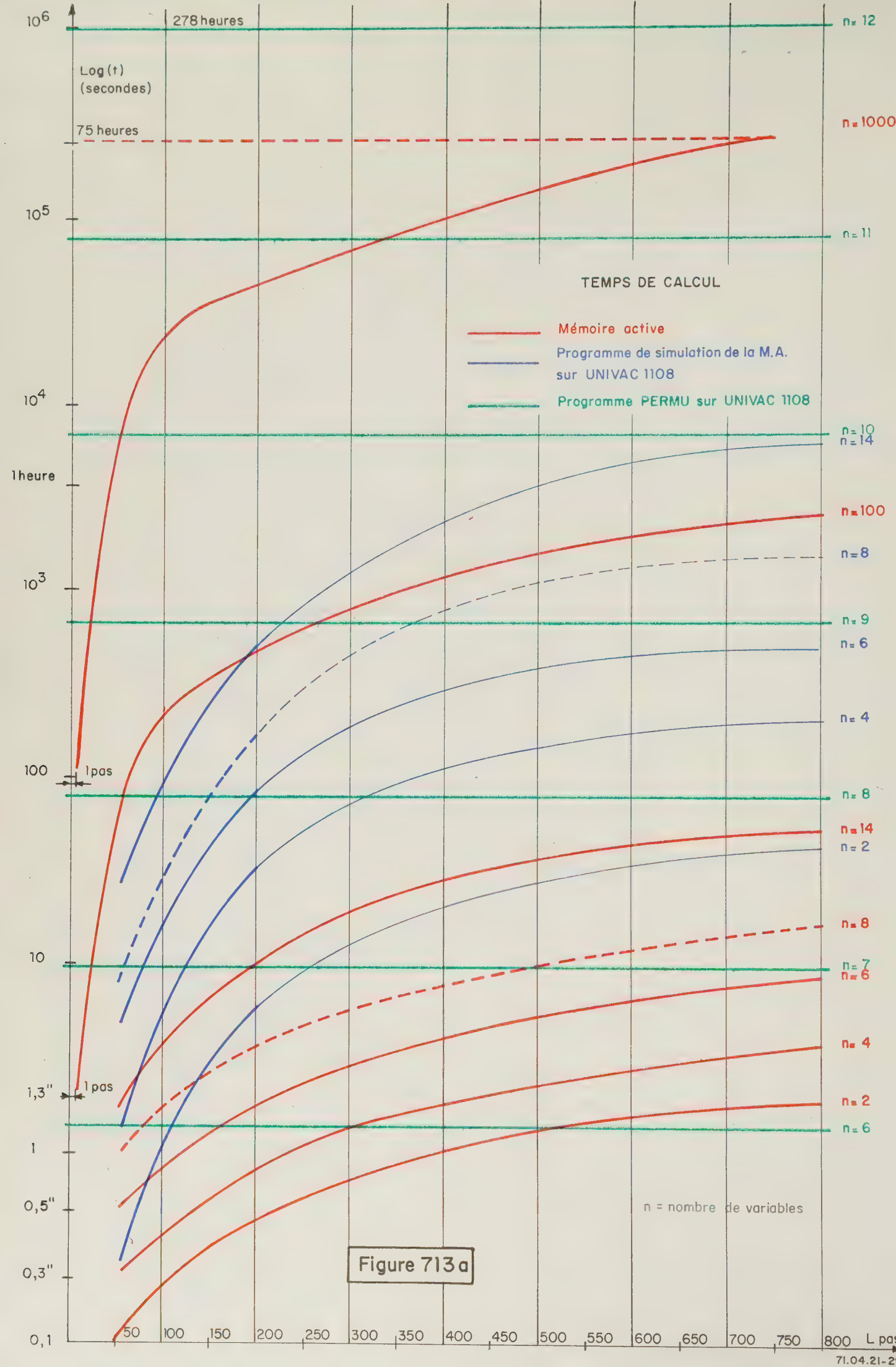
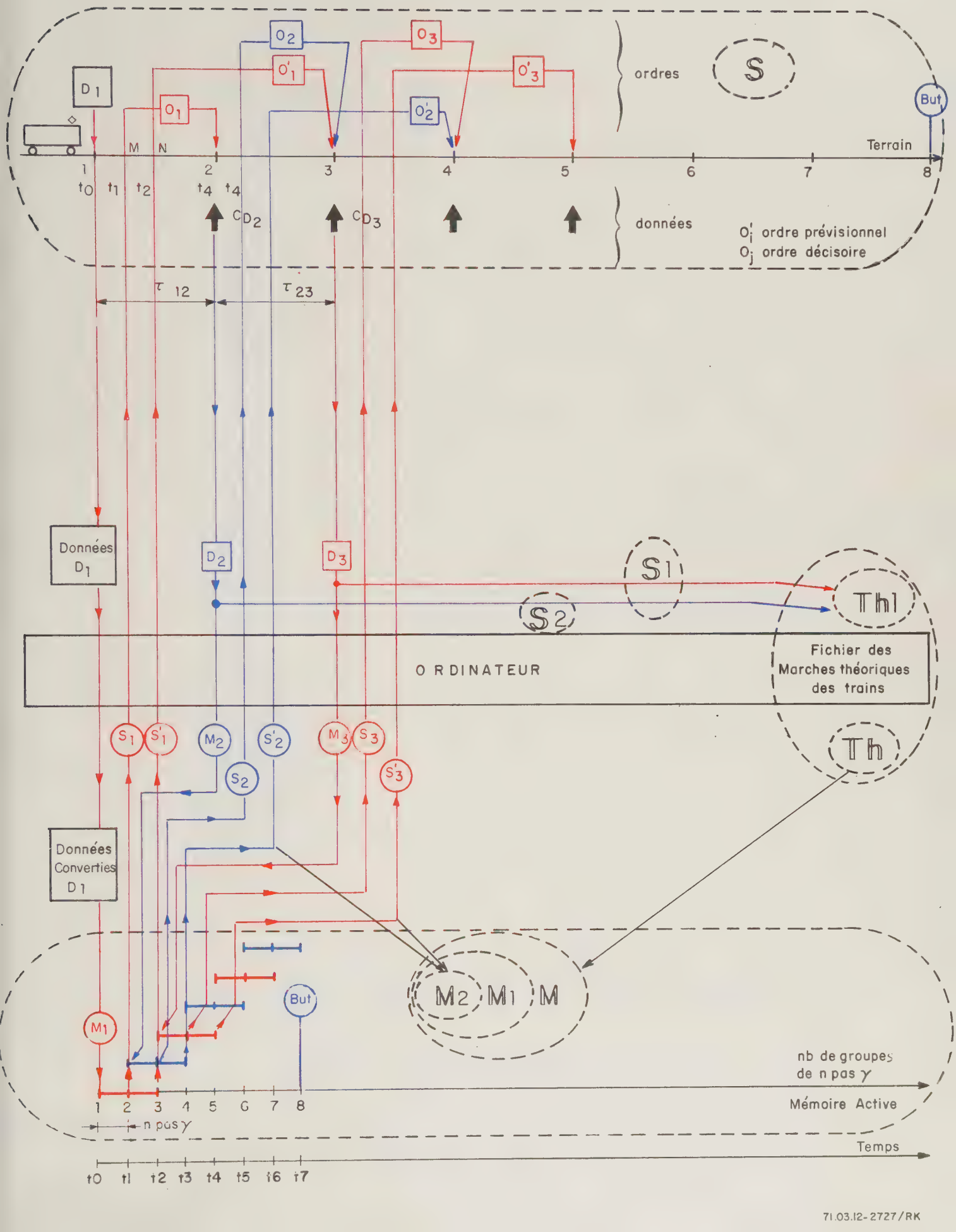

278 heures
Log (t)
(secondes)
75 heures
TEMPS DE CALCUL
Mémoire active
Programme de simulation de la M.A.
sur UNIVAC 1108
Programme PERMU sur UNIVAC 1108
1 heure
1 pas
1 pas
1,3"
n = nombre de variables
L pas γ
71.04.21-2927/RK

Figure 713 a

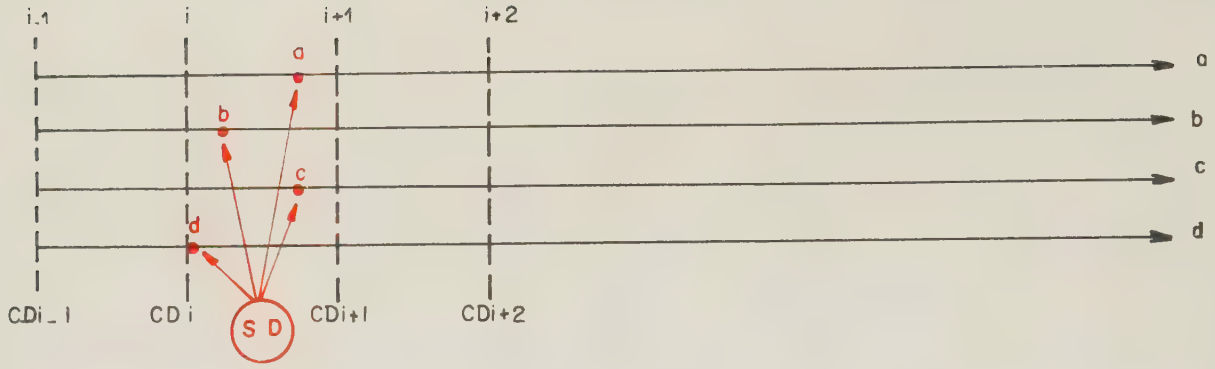
# FLUIDIFICATION RÉÉVALUABLE PÉRIODIQUEMENT ( F.R.P.)

Figure 723 a




71.03.12-2727/RK

Fig. 723 b



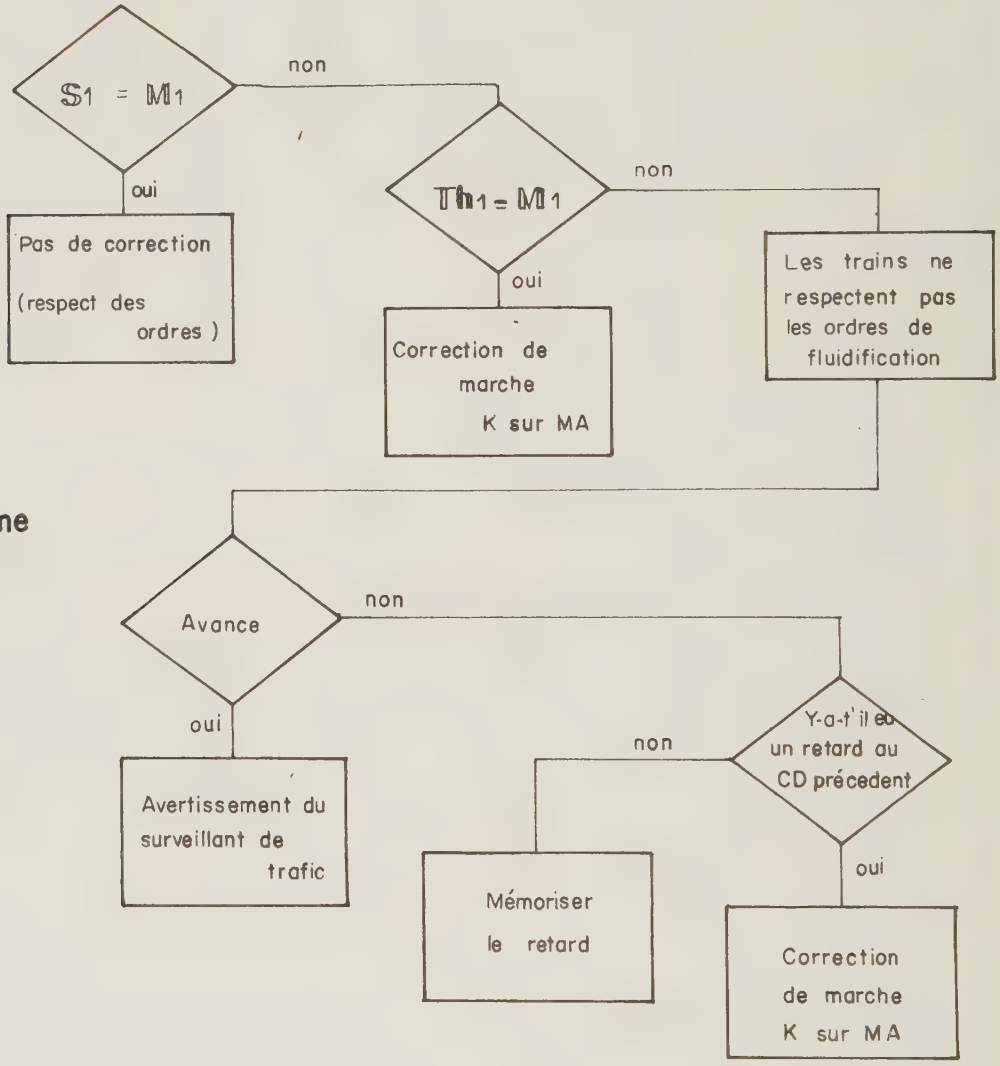
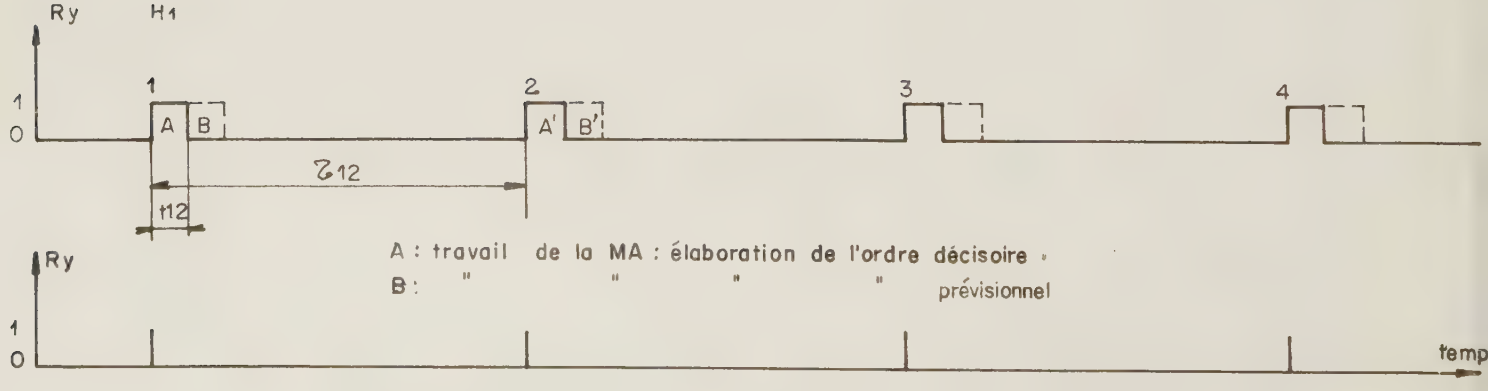




Fig 723 c Ordinogramme

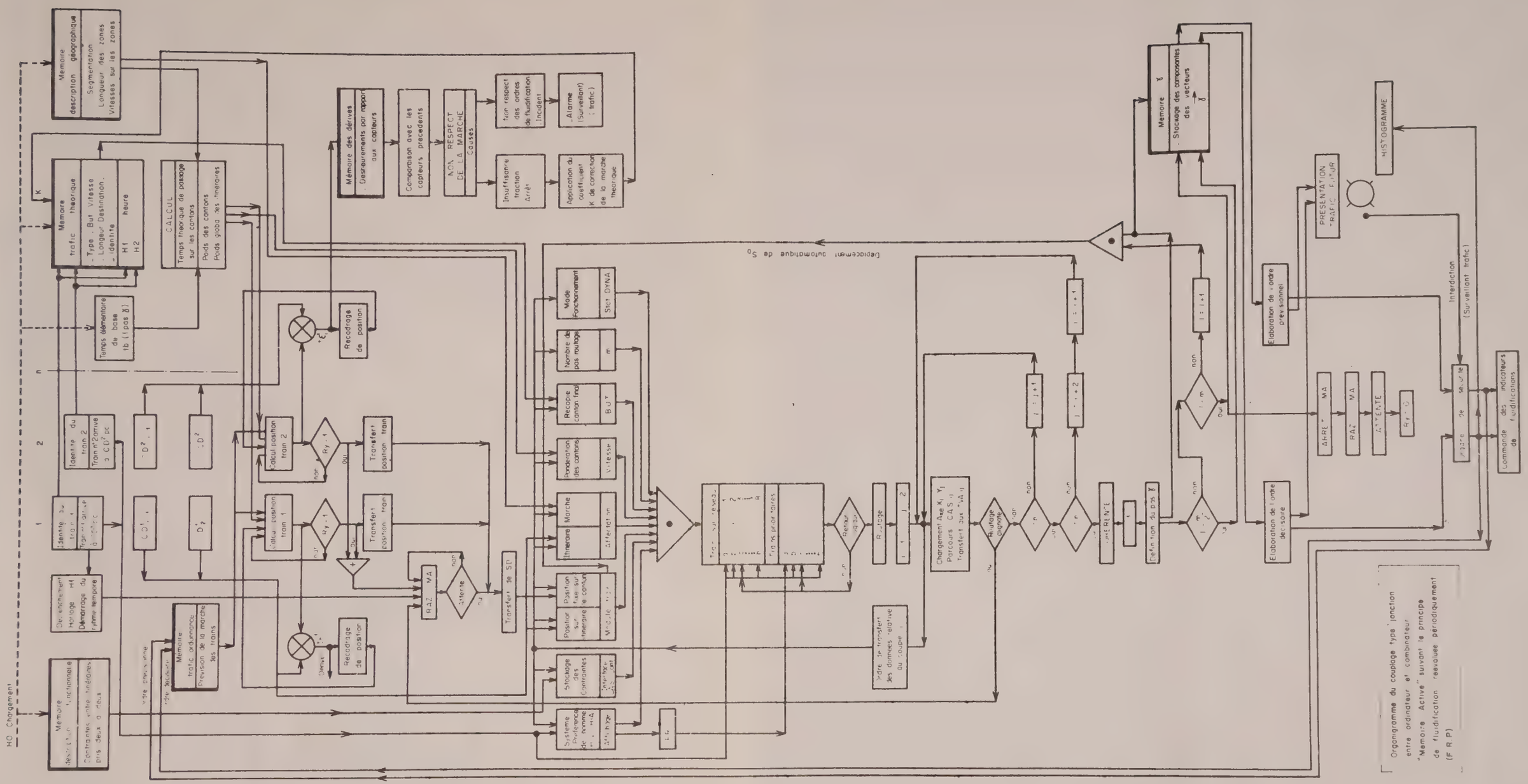



A : travail de la MA : élaboration de l'ordre décisoire
B : " " " " prévisionnel

Fig. 724 a Rythme temporel (de la F.R.P.)

71.04.15-2863/RK

Figure 724b

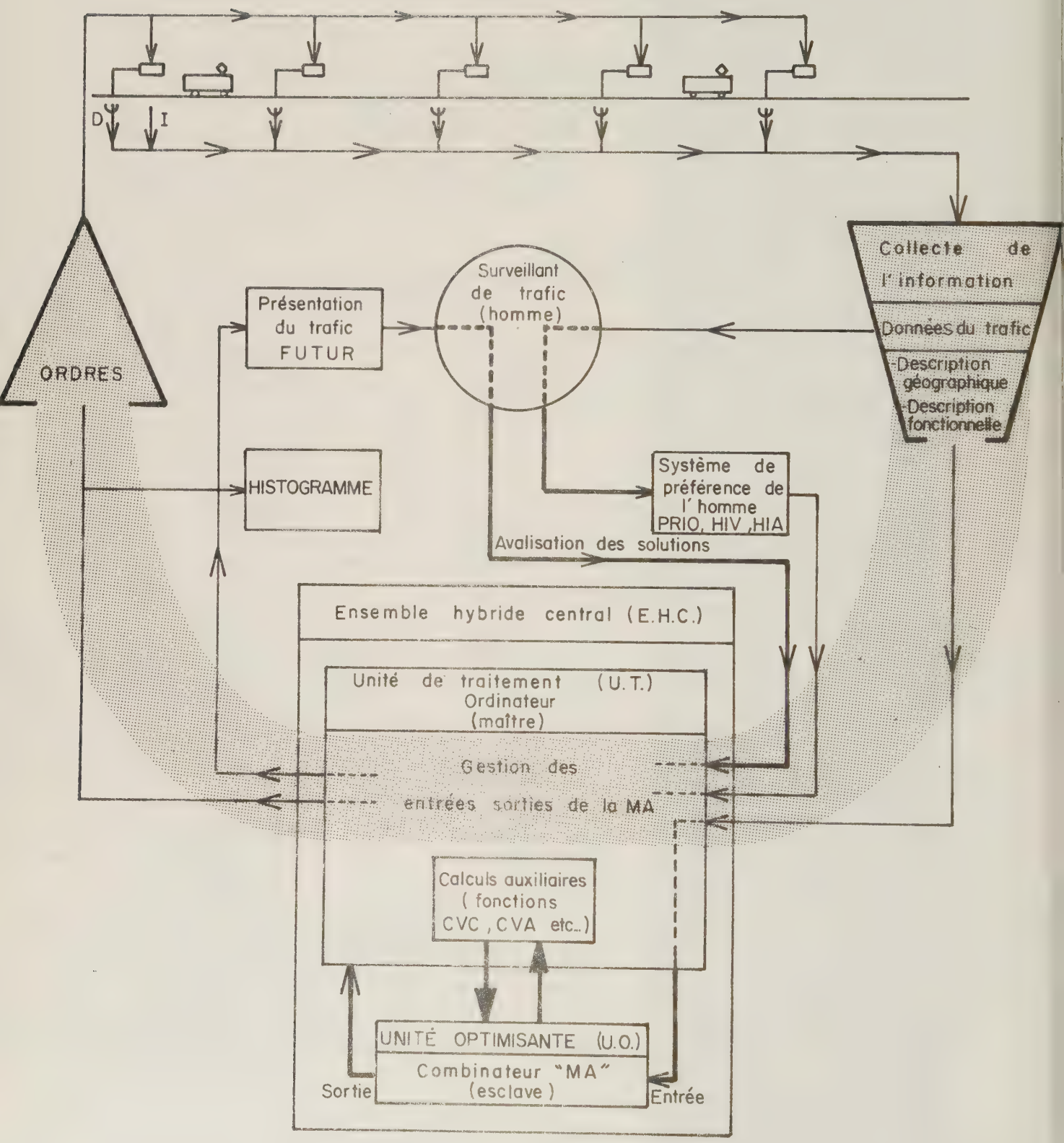



71.03.15-2729/RK

# INTÉGRATION DU COMBINATEUR "MÉMOIRE ACTIVE" DANS UN SYSTÈME CYBERNÉTIQUE FERROVIAIRE OPÉRATIONNEL

(Conception centralisée ou hybride)

Figure 73a



# Correction de la dérive

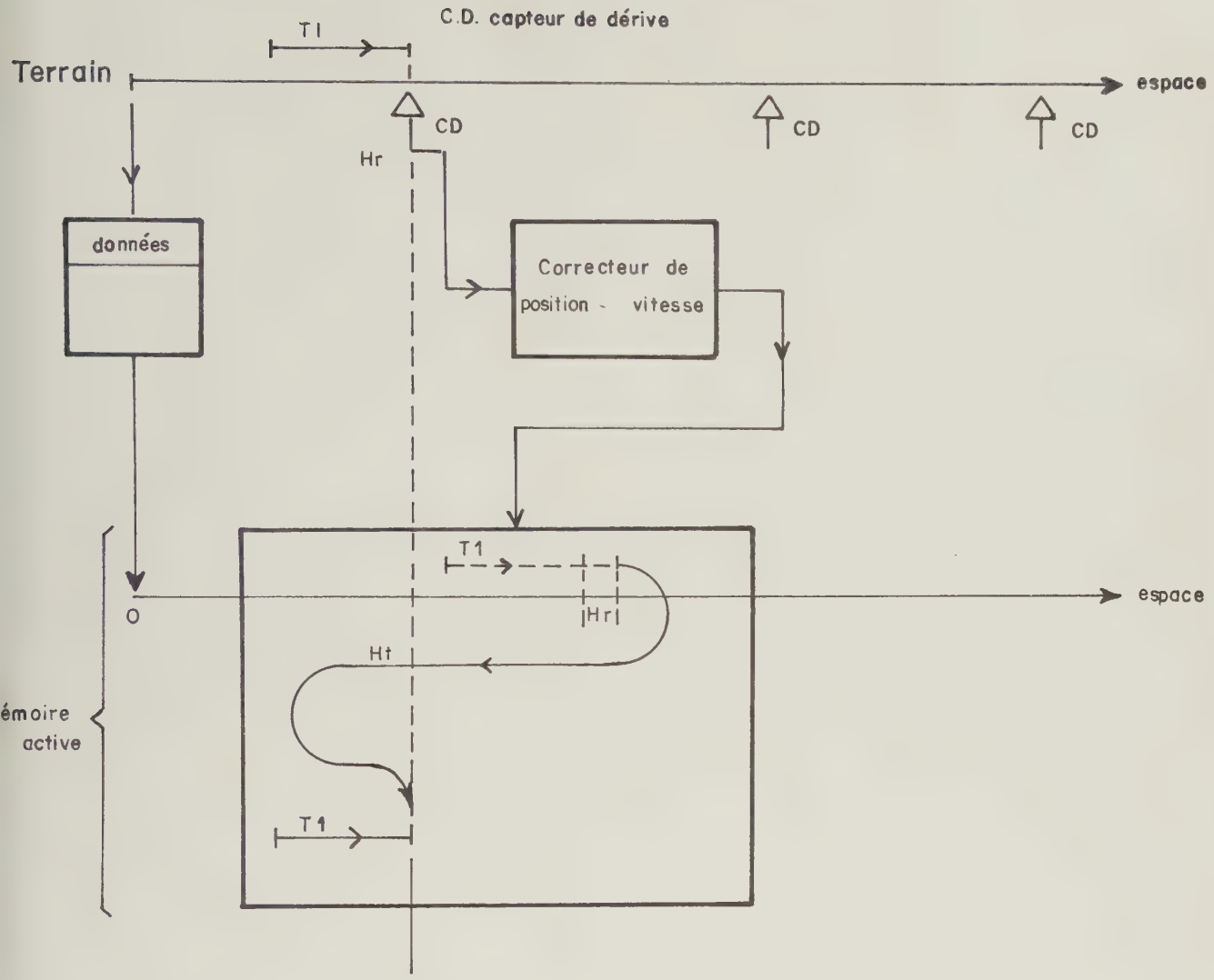
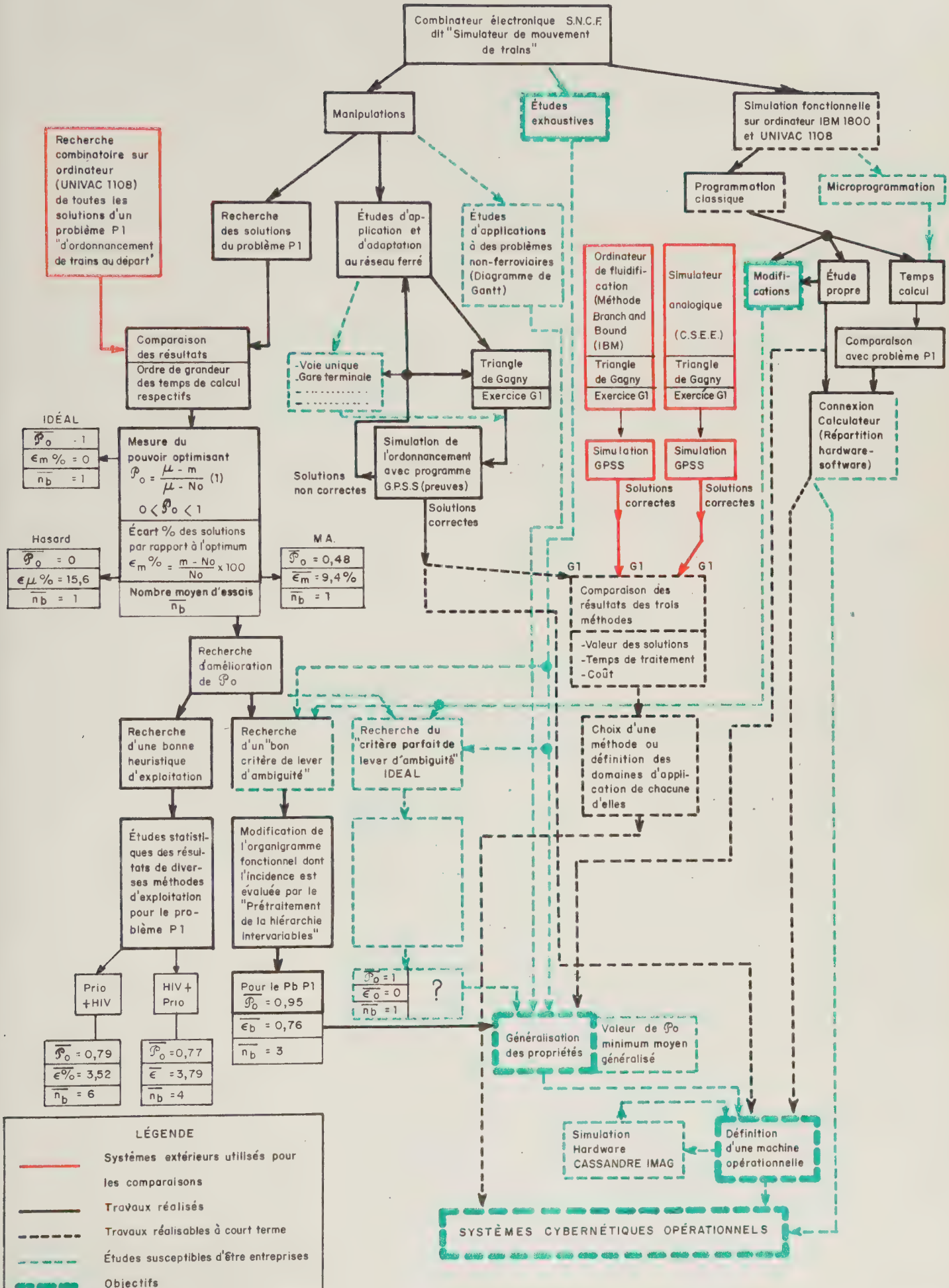



Fig. 73 b

# CHAPITRE 8

## Conclusion générale

# ORGANIGRAMME 81 a




71.03.23-2746/RK

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Bureau des Enseignements du 3e Cycle

tél. 336.25.25 et 325.12.21

# PERMIS D'IMPRIMER

DOCTORAT : . . . . . .

THESE DE : . . . DOCTEUR - INGENIEUR . . . . . .

NOM : . . . GENETE . . . . . .

Prénoms : . . Maurice . . . . . .

né le 16 Août . . . 1942 . à . . . Trezelles . . . . . Dépt : . . Allier

1ère THESE : . . Contribution à l'étude ,à la réalisation et à l'exploitation d'un prototype expérimental de combinateur électronique optimisant adapté à l'ordonnancement et à la fluidification du trafic ferroviaire,basé sur le principe dit "MEMOIRE ACTIVE." . . . . . .

. . . . . .

2e THESE (Propositions faites par l'Université) : . . . . . .

. . . . . .

. . . . . .

. . . . . .

ACADÉMIE DE PARIS
UNIVERSITÉ
PARIS VI

Vu et Approuvé

PARIS, le . . . 16. Juillet. 1971

Le Président

de l'Université de PARIS VI